Emergence and Structure of Urban Centralities in a Medium-Sized Historic City

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Abstract
Within the last 20 years, medium-sized cities in Portugal’s interior have been subject to a process of “desertification.” They have progressively lost in terms of economic activity, value and vitality, with the corresponding erosion of their heritage value. One exception to this general trend is the town of Évora. Of particular note is the vitality of its historic center (designated as a World Heritage Site in 1986) and the balance achieved between the center and a number of subcenters outside the walls. Here, urban centralities have proven to be an essential component of the urban structure in the fight against urban failure. This research project analyzes the relationship between town planning and the emergence of urban centralities. Historic towns are a very particular case, with subcenters emerging as a town grows and the historic center co-evolving with the entire urban area and surrounding urban centralities. The rise of centralities testifies to the vitality of the town. This article seeks to understand what factors have led to the balance of urban centralities in Évora by examining their structure and how they have emerged in the context of planning policies and urban growth. The methodology adopted crosses the results of three different approaches to highlight the emergence of urban centralities: identification and assessment of urban centralities, analysis of urban areas based on a space syntax approach, and the study of urban planning and management policies focused on centralities. The results help to characterize urban centralities that coexist with a strong historic center.

Keywords
urban centralities, space syntax, historic center

Introduction
Urban centralities are seen as hubs of activity, as important elements within the structure of towns that contribute to urban vitality and fight urban failure. In many cases, urban policies and planning dictate measures regarding the location, size, and composition of these urban centralities, but these regulations alone are unable to provide urban growth.

The real long-term evolution of urban development depends on many macro factors: the economic, social, cultural, and political environment; the urban system as a whole; the positive or negative influence of planning regulations; the desires of private investors and the real estate market. Urban centralities are associated with a given city’s evolution, but the influence of local factors can only be perceived over long periods of time. This article examines the emergence of such urban centralities in a town that has avoided the more common fate of urban failure of middle-sized towns and cities in the interior of Portugal.

Évora is a medium-sized town (~45,000 inhabitants) and its historic center (HC) has been listed as a World Heritage Site by the United Nations Educational, Scientific, and Cultural Organization (UNESCO) since 1986. The town was shaped by considerable expansion in the latter half of the 20th century, which coincided with changes to its economic base, where the services sector was the main driving force. In recent decades, the functional structure of the town has become more complex, and the pattern of activities has become less segregated, as planning has endeavored to promote mixed and functionally balanced neighborhoods. The town has a long history of urban planning, with a succession of different types of plans that have shaped its form and its activities over the last 40 years.

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As mentioned by Solis et al. (2018), “(…) la investigación sobre los municipios con conjunto histórico debe establecerse a dos escalas complementarias. Una, la escala inter-urbana, (…) Otra, la escala intra-urbana (…)” (p. 125). These authors studied the metropolitan area of Madrid and recognized three factors of centrality affecting the municipalities with historical center: the historical value, the political-administrative aspect, and the economical factor (Solis et al., 2018).

The regional location of Évora and its concentrated settlement pattern inhibits external influences resulting from urban changes in land use in other towns in the vicinity, making Évora a good case study to the analysis at intra-urban scale.

Several factors have enabled Évora to succeed as a middle-sized town in the interior of Portugal. As the emergence of centralities is crucial in this process, what are the factors that have contributed to the emergence and balancing of urban centralities in Évora? This research analyzes the relationship between the planning in medium-sized historic cities planning and the emergence of urban centralities.

To answer the preceding question, a diachronic survey of Évora’s urban centralities was carried out, an assessment of these centralities was made, and an analysis of the city’s urban planning was undertaken. For the assessment of these urban centralities, a diachronic analysis using space syntax techniques provided insight as to their evolution, namely, the critical factors that influence the process. Subsequently, information from these three different approaches was crossed, with a view to better understanding the “success” of Évora’s urban development and the conservation of its HC. The results will help to characterize urban centralities in a medium-sized town that coexist with a strong HC and evolve with it. Finally, this study is also expected to provide insight into the role of the HC in this specific context.

**Concepts of Urban Centrality**

Although there is no widely accepted definition, nor means of measurements, of the concept of urban centrality (Pereira et al., 2014), it is commonly accepted that urban centrality is the characteristic of a place being central to its periphery. Merlin and Choay (1988) argue that an urban centrality should be understood as a place, not as a point, having different dynamic characteristics (visual, structural, and/or functional) and sometimes acting as an economic hub. They propose three types of urban centralities: the HC (the original core of a town), the topological center (which, in general terms, coincides with the original settlement), and the business center (from the American concept of central business district [CBD]). For the purpose of this article, urban centrality applied to settlements applies the notion of “activity nodes” proposed by Alexander et al. (1977, p. 163)—a community spot where public life takes place around shops, services, facilities, and public space—or the notion of “live centrality” (Hillier, 1999) favored by and influenced by the “movement economy” process. In other words, herein the term—“urban centrality”—will be used to mean a place of human activities.

These places usually occupy a prominent location within the town (Cutini & Rabino, 2013), very often near main street intersections, thus capturing all the locational advantage of the area, as reflected in the land values (Porta et al., 2009). They have a higher building density, with a concentration of complementary activities (commercial activities, services, and facilities), and also benefit from the movement economy with high levels of pedestrian traffic, having a living core made up of retail shops, restaurants, and entertainment establishments (Hillier, 1999). Urban centrality can also be synonymous with attractiveness and be part of a continuous spatial-functional urban process. This idea is close to the notion of attractor (Scoppa & Pepons, 2015), which corresponds to a clearly identifiable center.

A number of different analytical methods can be used to identify urban centralities within a town and to measure their power (Porta et al., 2005). However, the most traditional method is based on using a site survey to collect data on the distribution of commercial activities and services, particularly retail trade, which generally is the best indicator of centrality (Gaspar, 1985). It is this method that was used in this study.

**Space syntax,** with its syntactic analysis, such as axial maps, allowed for an overall view of the urban areas, also providing useful insight in terms of identification of the urban centralities through its central concept of integration and numerical measures of integration. Integration is used as a measure of quality for urban areas (Tecklenburg et al., 1993) and is also a reliable indicator of centrality (Cutini & Rabino, 2013), correlating distribution of economic activities with attractiveness. According to Hillier (2001), the functional center corresponds to the nucleus of integration, which is made up of axes of a higher overall integration. Whereas the space syntax “integration” value is related to attractivity, the “choice” value is related to movement, which also reflects centrality due to the locational potential for retail activities along the axes (Porta et al., 2009). The effects of urban centrality on multiple scales show that the “integration” and “choice” values seem to correspond to patterns of urban activities and movement (Cutini, 2001). In contrast, suburbanization apparently leads to the progressive segregation of central areas in urban agglomerations and to a decrease in integration values (Serra & Pinho, 2011). As argued by Hillier (1999), “Centrality, then, is clearly not simply a state, but a process with both spatial and functional aspects” (p. 06.4). These urban centralities can shrink and shift. They can also expand, become denser, and at times may be supported by pedestrian networks (Alexander et al., 1977). Over time, a hierarchy of centers and subcenters may emerge (Hillier, 1999).
Method

The methodology adopted in this study aims to cross the results of three different approaches to highlight the emergence of urban centralities. A survey and assessment of urban centralities as proposed by Gaspar (Gaspar, 1985), a space syntax approach (Hillier, 1996; Hillier & Hanson, 1984), and a chronological urban plan analysis. The adopted methodology was applied in three stages:

1. To identify and assess urban centralities, a survey, diachronic analysis, and a centrality index (CI) were carried out, following the methods proposed by Gaspar (Gaspar, 1985);
2. Space syntax was used to analyze the urban form characteristics, which have proved to be important with regard to the degree of attractivity of an urban space, thus helping to identify urban centralities;
3. An analysis of urban planning in Évora was carried out.

First Stage—Identification and Assessment of Urban Centralities

Five time periods were selected: pre-1882, 1882 to 1945, 1945 to 1975, 1975 to 1990, and 1990 to 2013. These periods correspond to different stages in Évora’s development. A cycle of urban expansion to the east of the HC and of urban planning (the urban land use plan) commences around 1945. In 1975, a new cycle of urban growth takes shape, with expansion mainly to the west and southwest of the HC, but also to the North. The year 1975 marks the starting point of new urban policies and plans, resulting from the democratization of local government. In around 1990, new urban policies and approaches to planning (e.g., promoting mixed functions) are initiated. To begin with, urban centralities were identified based on the concentration of activities detected in a field survey made in 2013 (Miranda, 2014), which in turn updated a 2006 survey of retail and services (Salgueiro et al., 2007). The criteria used to identify urban centralities were concentration of central functions, retail, services, and complementary activities accessible from the public space. This field survey provided a set of data that made it possible to characterize the current urban functions, identify and measure their composition, and compare the distribution pattern of urban activities.

The qualitative identification and characterization of urban centralities before 2013 was validated by means of historical documentation from the City Council archives, interviews with planners, and older studies of the town that had a similar purpose (Salgueiro et al., 2007; Simplicio, 2013).

Clusters were defined ad hoc after an overall observation of urban functions. Centralities are areas with a clear contiguity of functional units (shops, offices, services, and facilities) located throughout neighboring buildings and blocks that are accessible through common public space. Isolated or dispersed functional units were not considered in the clusters.

Similar studies reveal urban structures characterized by centers and subcenters (Hillier, 1998, 1999; Panerai et al., 2009), specialized centers (Mangin & Panerai, 2009), or three levels of urban centralities: principal, local, and intermediate or secondary (French & Hamilton, 1979; Gaspar, 1985). Indeed, they show a polycentric organization of urban centralities of different types—specialized areas of trade and services, centers or blocks devoted to administrative functions, educational facilities, and commercial activities (Queffelec, 2007), and urban centralities near the headquarters of certain institutions (Mangin & Panerai, 2009).

The core indicator addressed here is the CI (IC in equation expressions) and was calculated based on the quantity of specialized functions (a bank is highly specialized and a bakery has a low degree of specialization) organized into eight classes, as defined by the National Institute of Statistics (INE, 2004). These different functions are the units of analysis used for measuring the IC. Based on that methodology, each of the eight classes was assigned a weight expressing different degrees of specialization. The IC follows a weighted additive aggregation model expressed by:

$$IC_i = \sum_{j} (F_{ij} \times V_j)$$

where IC is the centrality index for centrality i, F is the number of functions j found in each centrality—I, and V is the level of specialization (or value) of the functions j. Thirty-three different functions of j were identified, like cafeteria/coffee shop (present in all centralities), restaurant, health center/clinic, ready-to-wear clothing shop, hair salon, ATM machine, bank branch, household articles shop, tobacco and newspapers shop, supermarket/grocery shop, real estate agency, and so on.

The IC was standardized into a scale of 0 to 100, where 100 was deemed to be the maximum IC value found for the HC.

Second Stage—Space Syntax Approach

Space syntax considers the urban tissue as being formed by a set of segments characterized by different values represented on a chromatic scale based on

- Connectivity: Number of direct links to each segment;
- Global integration: Average distance between each segment and all the others;
- Local integration: Average distance relative to the surrounding area, considering only a limited number of segments;
Choice: Gives the hierarchy of urban spaces indicating preferred routes.

The Space Syntax Approach to urban form was used to analyze the correlations between the structure of the urban space and patterns of social use and urban occupancy. This approach seeks to understand morphological structures by quantifying their configurational properties and comparing different spatial systems (Heitor et al., 1996), thus revealing different levels of accessibility and different locational potentials. However, space syntax does not provide a complete picture of all the factors that influence the emergence and evolution of urban centralities. It is used broadly to analyze several characteristics of urban form, which have proved to be relevant for the attractiveness potential of an urban space. This methodology was frequently used by Hillier (1998, 1999), Cutini and Rabino (2013), and Serdoura (2004), usually from a synchronic perspective. In this study, a diachronic perspective was also used to map the urban evolution to analyze the emergence of urban centralities in relation to the town’s changing structure.

Diachronic analysis (Sheer, 2004; Stanilov, 2004; Tatom, 2004) is important to visualize growth dynamics, identify development trends, or analyze effects before and after the implementation of a project (Önder & Gigi, 2010). Serra and Pinho (2013) developed a method for diachronic modeling of street systems in the periphery of the city of Porto, using GIS and axial mapping. The use of diachronic analysis to examine the dynamics of urban centralities is difficult, given the absence of data and complementary information. Placing the focus on the dynamics of urban centralities, Scoppa and Pepons (2015) argue that many factors contribute to the emergence of these, such as concentrations of commercial activities and services, but that it is not always clear how these activities correlate to population distribution, employment, distance to the town center, distance to transport interfaces, and zoning. A possible explanation for the emergence of urban centralities may be that business activities are located near the urban streets included on cognitive maps of cities, where the routines of daily life create a sense of public space. Jansen (2003) and Roo and de Silva (2012) have shown how changes in the built-up area and transport infrastructures seem to have had considerable influence on the evolution of urban centralities in the Amsterdam region in the 1967 to 2001 period.

Cross-referencing the field survey, the space syntax study and the analysis of urban plans has shed considerable light on the dynamics of urban centralities in Évora.

Third Stage—Urban Plan Analysis

Up until the 1940s, Évora was virtually confined to within the city walls (Figure 1) and had approximately 26,000 inhabitants. Between 1942 and 1945, the planner Etienne de Groer was invited to produce a new Land Use Plan for the town. The plan was inspired by the new garden city principles and featured low population densities in the area surrounding the walls. Planned urban expansion commenced outside the wall. However, the growing population demanded new housing and new urban developments, and the planning process was unable to meet the housing needs. In 1959, a revision of the 1945 plan was begun by Nikita de Groer. Important proposals for city infrastructures included new ring roads to the north and south. However, this revised plan was never approved, nor was a subsequent one devised by Conceição e Silva. By the 1970s, new illegal development areas had sprung up. After the 1974 revolution, the democratic regime decentralized power and town and city councils became in charge of their own municipal spatial planning. By this time, there were about 33 scattered urban areas outside the wall that had no effective infrastructures (Abel, 2008). Subsequently, urban strategy focused on the following: the construction of basic infrastructures, the redevelopment of illegally built areas, the development of different
types of plans, and the definition and implementation of a land use policy for the town (Carvalho, 1990). Between 1940 and 2000, the population nearly doubled in size and the urbanized area grew to cover some 1,000 ha—10 times larger than the old urban area inside the walls. The latter half of the 20th century was marked by the growth of the tertiary sector. After 1979, the reopening of Évora University and the installation of several public facilities strengthened the HC inside the old walls. The objective of preserving the HC had been a part of plans and bylaws since 1937. The various plans that were developed regarded the HC as the center of the town and they always endeavored to make its modernization compatible with preserving and safeguarding the intrinsic value of the older urban area.

Over the last two decades, commercial activities and services have spread throughout the entire urban area and multifunctionality is currently a reality outside the walls. The distribution of employment has also changed as, in addition to the HC, there is also a concentration of new economic activities in the southern part of the town and several smaller urban centralities have emerged.

Figure 2 shows the upsurge in planning activity after 1974 when a democratic regime was established in Portugal. Of the different types of plans (Figure 2), some are particularly noteworthy: urban land use plans of a regulatory nature that encompass the entire town, a strategic plan made in the 1990s, and detailed plans for main urban areas.

Results and Discussion

Classification, Assessment, and Emergence of Urban Centralities

Typology of urban centralities. Ten urban centralities were identified in 2013. Their spatial distribution is not homogeneous, reflecting a nonhomogeneous urban growth. Their highest concentration is located in the western part of the town in new residential areas that include industrial and service activities.

A number of these urban centralities are located near the HC, outside the old city in the ring encircling the walls (Figure 3). Another group is located in an outer belt further away. A hierarchy of urban centralities can be determined by cross-referencing the number of functional units with their degree of specialization. Thirty-three different functional units were identified. The cafeteria/coffee shop functional unit was the only one present in all urban centralities. Other functional units identified included restaurant, health center/clinic/general practitioner office, clothing shop, hair salon, ATM machine, bank branch, household article shop, newsagent, supermarket/grocery store and real estate agency.

In Évora, we identified five types of urban centralities (Figure 3) that fit the typology described by Salgueiro et al. (2007) for medium-sized Portuguese cities (i.e., between 10,000 and 115,000 inhabitants according to the National
Program for Consolidation of the National Urban System [PROSIURB]):

a. HC—The main center, multifunctional, with a large number and diversity of functions and a high CI score;
b. Centrality of services (CS)—Very specialized functions associated with the tertiary sector along with some less specialized activities, having a medium/high CI score (CS.5, CS.10, and CS.12);
c. Centrality of commercial activities (CC)—concentration of commercial activities associated with supermarkets or hypermarkets, with supra-local importance and a high/medium CI score (CC.7);
d. Local urban centralities, Type 1 (CL1)—Proximity centers with a predominance of less specialized functions of local relevance related to supra-local specialized functions and with a medium or high/medium CI score (CL1.2, CL1.4, CL1.6, and CL1.14);
e. Local urban centralities, Type 2 (CL2)—Proximity centers where nonspecialized or less specialized functions are only of local relevance and specialized functions are nearly absent, having a low CI score (CL2.1, CL2.3, CL2.8, CL2.9, CL2.11, and CL2.13).

The HC. The HC of Évora corresponds essentially to the city inside the walls. For centuries these walls served as the town’s main defensive system and formed its boundary. The area covers approximately 100 ha and had its genesis in Roman and Mediaeval times. This old area is central to the entire town, a topological centrality that has resulted from the convergence of many roads and pathways since antiquity.

Table 1 shows that the HC corresponds almost to one tenth of the town in terms of surface area and population. However, it is home to more than one third of all businesses, nearly half of all retail and service activities, and three fifths of all community facilities. This is relevant to understanding the nature of its centrality, which is based on a high number of specialized functions, some of which correspond to public facilities. Also worth mentioning are cultural and recreational facilities (79%), justice (89%), educational (36%), and social/community facilities (29%). There is also a significant presence of retail outlets. The population density is roughly the same inside and outside the walls, despite the high degree of urban compactness inside the HC.

The HC is clearly prominent in the hierarchy of centralities (Figure 4). Its central position is so dominant that it seems to determine the distribution of the other centralities in two subsequent rings outside the city wall although it is true that, in the outer belt, recent urban development seems to have had a strong influence.

Assessment and location of urban centralities. The CI confirms the hierarchical importance of the HC. A 0 to 100 scale was adopted, where 100 was assigned to the maximum CI value found for the HC (Figure 4)

In terms of location, all urban centralities with a CI score above average are located within the first ring road in the transition zone surrounding the HC—CS.5, CS.10, and CS.12 (Figure 4).

Most CLs are located in residential and consolidated urban areas, and some of them are in peripheral positions, such as CL2.1 or CL1.14. Both CL1 and CL2 are located near local or secondary streets linking different urban zones, but CL2s emerge in high population density locations. CLs with low CI scores are located in the heart of residential zones and in peripheral locations, but even those in peripheral locations are not segregated or far from main roads or intersections. Urban centralities located close to the main urban roads are those surrounding the old walls along the first ring road (CL1.4, CS.5, CS.10, and CS.12). CL1.2 is also near a national road (main road network). Intersections between secondary streets are also preferred locations for the emergence of urban centralities (CL2.3, CL1.4, CS.5, CL1.6, CC.7, CL2.9, CL2.11, and CS.12). Commercial activity centrality CC.7 also emerges near the outer ring road in the southwest sector. It is clearly located on the periphery where open space, large parcels of land, and lower land prices have favored the emergence of large-scale retail and logistics establishments, which is not possible in inner-city locations.

In Évora, the distribution of urban centralities parallels the distribution and density of the resident population (Figure 5). Out of a total of 15 urban centralities (including the HC), nine CLs are located in areas with a population density greater
than 50 inhabitants/hectare. The same is true of four of the CSs. The exception is commercial activity centrality CC.7. This means that, except for the HC and for the new commercial activity centrality CC.7, all the other centralities seem to emerge based on the number of people living nearby.

If one divides the town into four quadrants, corresponding to the cardinal directions, the average population per centrality is about 3,500 inhabitants, ranging from 1,900 to 2,600 in the more consolidated urban sectors. In the north quadrant, CL2.1 is more isolated, serving a residential area of 8,600 inhabitants (Figure 5). Centralities arise from potential customers of routine services.

The concentration of urban centralities in the western part of the city can be related to the population density stimulated by proximity to a motorway junction providing rapid access to Lisbon. The interdependence between centrality and accessibility is confirmed. Ancient trading routes leading to the HC seem to be very important in attracting urban

| Urban Sector                  | Area (ha.) (2013) | Pop. (2011) (ha.) | Density (ha.) | No. of firms (2011) (ha.) | No. of trade and service units (2006) (ha.) | Main public institutions (2013) (ha.) | Community facilities (2013) (ha.) |
|-------------------------------|-------------------|------------------|---------------|--------------------------|-------------------------------------|-----------------------------------|---------------------------------|
| Historic center (HC)          | 100 (10.26%)      | 4,738 (10.45%)  | 47.38         | 2,055 (36.56%)           | 837 (47.07%)                        | 33 (59%)                         | 73 (36%)                        |
| Town outside HC walls        | 875 (89.74%)      | 40,612 (89.55%) | 46.41         | 3,566 (43.44%)           | 941 (52.92%)                        | 23 (41%)                         | 129 (54%)                       |
| Town of Évora                | 975               | 45,350           | 46.51         | 5,621 (36.56%)           | 1,778 (47.07%)                      | 56 (59%)                         | 202 (36%)                       |

Figure 4. Urban centralities ranked by centrality index (CI).
Source. Miranda (2014).
centralities (CL1.4, CL1.6, CL2.9, CL2.11, and CL1.14), confirming the perspective of Panerai et al. (2009). Others urban centralities (CL1.2, CC.7, and CL2.8) rely on newer main radial roads. The HC seems to grow through a multiplication of different CSs and CLs in all directions, which reinforces the complementarity between the traditional center and its urban periphery (Figure 6). However, the urban centralities with higher CI scores are grouped in a Y-shape centered on the HC (Figure 6), which follows the directions of the main roads. All urban centralities with high CI scores rely on these axes, except for CL1.6, which lies very close to CS5, suggesting some sort of complementarity. CSs located around the HC are clustered in a ring outside the HC. All this illustrates the expansion of the tertiary sector in concentric rings around the HC, and the gravitational power that the HC exerts as the city grows, and also confirms the influence of the main road network on the distribution of centralities around the HC.

**Emergence of urban centralities.** The identification of centralities and their structure is inextricably linked to the town’s growth process and functional evolution (Figure 7). Over time, the functional structure tends to get more complex as a consequence of urban growth (Gaspar, 1985).

The five periods of urban evolution were defined based on cycles of urban expansion and planning policies in accordance with the available information (Table 2). In the latter half of the 20th century, and particularly in the 1980s, the emergence of urban centralities is forcing the development of centralities due to service function accessibility requirements. Up until the 1970s, the town had maintained a dominant radial structure with scattered urban areas grouped around the main radial roads. By the 1990s, urban occupation had spread around the periphery of the HC and a few urban centralities emerged. From 1990 onward (profiting from Portugal’s membership of the EEC and access to EC funds), the town invested in ring roads and acquired a radial-concentric structure (still incomplete), as envisaged in the urban land use plan.

New centralities emerged in urban sectors in line with the cycle of urban growth, after the consolidation of new neighborhoods, and approximately two or three decades after the new settlements first emerged. Between 1945 and 1975, a new centrality emerged in the main area of growth to the east of the HC. Between 1975 and 1990, three centralities emerged to the south and to the west of the HC. This area was then regarded as the sector of growth in Évora. After 1990, following urban consolidation in all urban sectors and the building of new infrastructures, nine new centralities emerged.

The radial structure was clearly related to the monocentric form based on the old HC. The synergy derived from urban growth and the increased accessibility provided by the ring roads generated great locational potential for new commercial activities and services and the emergence of new urban centralities outside the city wall, which has led to complementarity between the traditional HC and its surrounding areas (Figure 7).

Table 3 indicates the evolution of urban centralities over time. CLs (CL1 and CL2) with low or no specialization at all emerged as a result of the urban consolidation of residential
areas in response to the collective needs of the residents. CS followed urban growth and changes that occurred in the economic urban structure. They emerged close to the HC walls, influenced by proximity to the historic core. Ten new centralities emerged in the period between 1990 and 2013, when new urban developments and new ring roads were built. As the size of the town and the road system increased, urban centralities became more complex. The increasing number of centralities over time is indicative of their correlation to the development of the city. Apparently, urban centralities began to multiply after the urban area reached a critical point in terms of population, activities, and urban size (in the 1990s). At the same time, the HC has maintained a central role in the structure of the city.

Space Syntax Analysis

According to Hillier (2001), the functional center corresponds to the so-called integration nucleus, formed by segments with the highest degree of global integration: red, orange, and yellow. Selected segments are used to evaluate syntactic parameters in urban centralities, with those presenting the highest values for each parameter being analyzed and, simultaneously, compared in different time periods. The axial map of Évora follows potential car movement in all urban areas (Table 4). The figures were obtained from Depthmap—with higher figures for axial lines in centrality areas. The unit of analysis is the axial line with topological space distance.

Global integration and local integration values, and the correlations between them, are key to the emergence of urban centralities (Hillier, 1999).

Connectivity. In Évora (Table 4 and Figure 8), the average connectivity value shows a slight decrease between 1882 and 1990 (2.9 and 2.71, respectively). However, it increases slightly in 2013 when the radial-concentric structure becomes more complete. In 2013, 10 of the 14 urban centralities identified are supported by axes with high or medium-high connectivity, with values ranging between 3 and 15. The average connectivity of these urban centralities is approximately twice the average connectivity for the city as a whole.

Choice. The evolution represented (Figure 9) reflects the hierarchy of urban space and the radial-concentric structure. In general, for each centrality, the figures for choice increase over time along with the emergence of urban centralities (Table 4): 12 out of 14 centralities are supported by preferred routes.

Global integration. The average global integration decreased between 1882 (0.578) and 1990 (0.487) and increased again in 2013 (0.534). This reflects progressive fragmentation of the urban area followed by progressive consolidation of the urban expansion after 1990. The integration values of urban centralities are higher in 13 out of 14 centralities than the average for the city.

Table 2. Evolution of Urbanized Land, Population, and Density for the Whole City.

|                  | 1882 | 1945 | 1975 | 1990 | 2013 |
|------------------|------|------|------|------|------|
| Urbanized land (ha.) | 100  | 167  | 341  | 587  | 975  |
| Population       | 13,242\(^a\) | 26,416\(^a\) | 35,375\(^a\) | 42,399 | 45,350 |
| Density (inhab./ha.) | 132.4| 158.2| 353.75| 72.22 | 46.5  |

\(^a\)Figures from the Census years 1878, 1940, and 1970, respectively.
In 1882, the urban area coincided with the walled city. The integration nucleus with the highest integration value is clearly shown in red in Figure 10. It corresponds to the most important commercial areas (which have existed since the Middle Ages), namely, the old arcade-lined streets. As time progresses, we see clearly that the HC loses some of its global integration (red color), which dislocates to the immediately bordering areas outside the wall, precisely where the first ring road is located and where a set of specialized centralities (CS) emerged after 1990. Furthermore, eight out of the 14 urban centralities outside the walled city are located along axes with the highest integration values (0.80) and the highest attractivity for multiple functions. Outside the wall, there is a strong correlation between the global integration figures and three urban CSs—CS10, CS12, and CS5—and four CLs—CL23, CL14, CL29, and CL211.

Local integration. Between 1882 and 2013 (Figure 11), the local integration figure (R3) for the city fell from 1.45 to 1.39, reflecting an increase in urban fragmentation. After 1990, the number of segments reporting high values increased. The emergence of centralities corresponds to a general increase in local integration in those locations that achieve higher scores than the city average. Nine out of the 14 centralities are supported by axial lines with high- or medium-high local integration values. All the highest scores for local integration scores (above 2.5) correspond to CLs.

Eight in 10 of CLs have above-average scores for local integration. The local conditions of the grid measured in local integration is one of the keys in the emergence of subcenters, as Hillier (1999) found.

**Urban Planning and the Evolution of Urban Centralities**

Since 1947, various urban plans have called for the existence of CLs and areas devoted to tertiary activities. These plans were only partially implemented, with the local administration resorting to different planning tools:

- Land use zoning, namely, through delimitation of tertiary activity zones;
- Mandatory allocation of tertiary activities in private urban development proposals;
- Elaboration of detailed urban plans/studies, at the city council’s initiative, encouraging private real estate developments;
- Construction of the main road network in conjunction with green spaces adjacent to nonresidential land use areas;
- Retention of central functions in the historic core—headquarters of the city council and university (although these also expanded outside the walls out of necessity) and spatial concentration of social facilities and public services close to the new civic parish council offices;
- Approval of new large-scale retail establishments.

The revision of the Urban Land Use Plan (2000; Figure 2) was aimed at promoting quality of life and multifunctionality in residential areas and improving their integration by changing the rigid zoning scheme. New urban developments were required to allocate space for nonresidential activities on the ground floors of buildings, emphasizing complementarity of functions and mixture of uses. Studies and detailed plans were made. “Operational spatial units” were established to harmonize urban regulation and decisions with respect to the licensing of buildings and urban developments that were considered crucial to achieving urban consolidation and guiding the emergence of urban centralities, which in many cases were not foreseen in the urban plan.

The Urban Land Use Plan laid down the maintenance of central and residential functions in the HC, with a view to fostering a multifunctional urban core. Integration of the HC within the town was to be achieved through physical and functional articulation between the town inside the walls and the neighborhoods outside. The area surrounding the HC walls was redesigned to include new buildings, tertiary activities, new footpaths, and public spaces.

Planning and urban management has strongly influenced the process of emergence of urban centralities. There has been a clear focus on detailed planning schemes and on guiding private initiatives on the location of functions and urban design proposals. Successive plans show them evolving from

| Year       | 1882 | 1982–1945 | 1945–1975 | 1975–1990 | 1990–2013 |
|------------|------|-----------|-----------|-----------|-----------|
| HC         | 1    | 1         | 1         | 1         | 1         |
| CS         | 3    |           |           |           |           |
| CC         | 1    |           |           |           |           |
| CL1        | 1    | 1         | 2         | 5         | 15        |
| CL2        | 3    | 6         |           |           |           |
| Total      | 1    | 1         | 2         | 5         | 15        |

Source: Miranda (2014).

Note. HC = historic center; CS = centrality of services; CC = centrality of commercial activities; CL1 = local urban centralities, Type 1; CL2 = local urban centralities, Type 2.
Table 4. Évora—Space Syntax Values in Five Time Periods.

| City   | 1882 | 1945 | 1975 | 1990 | 2013 |
|--------|------|------|------|------|------|
|        | Connect | Choice | Glob int | Int loc | Connect | Choice | Glob int | Int loc | Connect | Choice | Glob int | Int loc | Connect | Choice | Glob int | Int loc |
| City   | 2.9   | 6.452 | 0.61   | 1.49  | 2.86  | 8.320  | 0.58   | 1.45   | 2.8   | 13.922 | 0.54   | 1.42   | 2.71   | 24.956 | 0.49   | 1.38   | 2.75   | 32.762 | 0.53   | 1.39   |
| CL2.1  | 6     | 17,395 | 0.34  | 1.93  | 6     | 75,303 | 0.41   | 2.48   | 4     | 85,148 | 0.65   | 2.07   | 4     | 144,868 | 0.58   | 2.07   | 4     | 177,172 | 0.69   | 2.04   |
| CL2.3  | 9     | 94,172 | 0.47  | 2.53  | 15    | 133,644 | 0.54   | 3.09   | 9     | 77,710 | 0.57   | 2.65   | 10    | 185,776 | 0.66   | 2.75   | 5     | 177,802 | 0.61   | 2.11   |
| CL2.8  | 9     | 94,172 | 0.47  | 2.53  | 15    | 133,644 | 0.54   | 3.09   | 9     | 77,710 | 0.57   | 2.65   | 10    | 185,776 | 0.66   | 2.75   | 9     | 77,710 | 0.57   | 2.65   |
| CL2.9  | 5     | 177,802 | 0.61  | 2.11  | 5     | 292,176 | 0.71   | 2.17   | 5     | 177,802 | 0.61   | 2.11  | 5     | 292,176 | 0.71   | 2.17   | 5     | 177,802 | 0.61   | 2.11   |
| CL2.13 | 6     | 8,589  | 0.53   | 2.09  | 6     | 9,415  | 0.62   | 2.05   | 6     | 117,266 | 0.62   | 2.02   | 6     | 117,266 | 0.62   | 2.02   | 6     | 117,266 | 0.62   | 2.02   |
| CL2.14 | 6     | 110,594 | 0.59  | 0.89  | 3     | 165,737 | 0.61   | 1.39   | 3     | 165,737 | 0.61   | 1.39   | 3     | 165,737 | 0.61   | 1.39   | 3     | 165,737 | 0.61   | 1.39   |
| CS.5   | 6     | 649,079 | 0.80  | 2.11  | 6     | 649,079 | 0.80   | 2.11   | 6     | 649,079 | 0.80   | 2.11   | 6     | 649,079 | 0.80   | 2.11   | 6     | 649,079 | 0.80   | 2.11   |
| CS.10  | 4     | 487,903 | 0.72  | 1.77  | 6     | 117,892 | 0.83   | 2.11   | 4     | 487,903 | 0.72   | 1.77  | 6     | 117,892 | 0.83   | 2.11   | 4     | 487,903 | 0.72   | 1.77   |
| CS.12  | 4     | 101,632 | 0.82   | 2.13  | 6     | 175,124 | 0.56   | 1.93   | 4     | 101,632 | 0.82   | 2.13   | 6     | 175,124 | 0.56   | 1.93   | 4     | 101,632 | 0.82   | 2.13   |
| CC.7   | 6     | 175,124 | 0.56   | 1.93   | 6     | 175,124 | 0.56   | 1.93   | 6     | 175,124 | 0.56   | 1.93   | 6     | 175,124 | 0.56   | 1.93   | 6     | 175,124 | 0.56   | 1.93   |

Source: Miranda (2014).

Note. The figures given in the table report the highest values in the axial lines of the study areas in a specific period of time. In some cases the figures seem to foresee the emergence of centralities. CL2 = local urban centralities, Type 2; CL1 = local urban centralities, Type 1; CS = centrality of services; CC = centrality of commercial activities.
a functionalist perspective anchored in the segregation of functions toward a perspective centered on complementarity of functions and mixed uses. These facts reflect the evolution of urban planning as a discipline, progressive criticism of the functionalist city, and the leaving behind of the disadvantages of zoning in favor of fostering the emergence of a complex network of urban centralities, a key factor in the success of the HC of Évora on which the entire town depends. Urban functions of high attractivity are important from a dynamic perspective. They may reinforce an existing nucleus of urban activity or trigger the establishment of a future location of new social or economic activities and its urban development, thus supporting the notion of centrality. They may correspond to activities that satisfy collective needs or may simply be fashionable shops. The information available and data collected from site surveys identified the following attractive functions that were relevant to anchoring urban centralities:

- Cafés/coffee shops with large customer flows (in the past, the role of grocery stores);
- High-demand social and community facilities (e.g., medical centers);
- Local corporations and associations;
- Large commercial surfaces or large supermarkets;
- Public space.

Persistent strategic planning thinking and an active approach toward guidance (architectural projects, urban
design, detailed plans, and land management) for private urban development initiatives are considered positive factors in managing the emergence of urban centralities. Urban management is also important to ensure cohesion, for example, having a global concept for the main urban road network and the ability to integrate and manage different scales of planning.

**Conclusion**

Public policies have promoted the emergence of urban centralities in multiple ways. The building of the road network has played a very important role, as expected, in influencing the choice of location for private companies and public entities in the southern and southwest areas of the city. Urban

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**Figure 9.** Evolution of choice in Évora. 
Source. Miranda (2014).
planning followed three main guidelines that have had a considerable impact on this emergence process:

- A radial-concentric road structure in development since 1945 (still not finished);
- The promotion of multifunctionality in new neighborhoods outside the HC walls, particularly since 2000;
- Conservation and enhancement policy for the historic center as the main centrality.

Figure 10. Evolution of global integration in Évora. Source. Miranda (2014).
The results obtained reveal not only quantitative data on Évora’s resilience but also several factors having contributed and continuing to contribute to the emergence and consolidation of urban centralities in Évora, balancing the town’s urban development with the preexisting historical center, and expanding what was a single traditional center into a network of different types of urban centralities around the HC.

Évora’s quantitative success fighting urban failure is demonstrated by the figures for its growth: built-up surface area grew from 587 ha in 1991 to 975 ha in 2011, the population goes up from 42,499 inhabitants (1991) to 45,350 (2011), and the number of urban centralities rose from five in 1990 to 15 in 2015.

It would seem (but it is not absolutely clear) that urban centralities start to multiply after the urban area had reached a critical point in terms of population, activities, and size. Apparently, there was a time gap between the physical expansion that took place in the 1970s, when the town decisively expanded outside its historic walls, and the 1990s, when newer urban centralities of different kinds, mainly local, began to emerge. Both these processes appear to be important and interdependent.
As so many middle-sized towns are failing, despite local and central government policies designed to counteract this process (and all its harmful consequences such as desertification of the interior country), the idea of a critical point of population density and activities would help the responsible entities to program investment and planning actions with a view to achieving “the critical point” from which urban settlements seem to successfully manage their survival when facing processes of failure.

Density of resident population favors the emergence of CLs. Other types of urban centralities are associated with synergies derived from concentration of commercial activities and services with different levels of specialization.

Space syntax parameters related to the emergence of urban centralities, when compared with the city averages, reveal the following: medium-high scores for connectivity, higher scores for global integration, higher values for choice, and higher values for local integration (although with some exceptions).

In Évora, centrality is a process, dynamic, both functional and spatial, and evolving over time.

Only two centralities, CL1.14 and CL1.6, do not score highly for global and local integration although CL1.14 is located near a road with high score for choice.

All the other centralities with low global integration scores have high figures for local integrations, which is in line with other syntactic studies (Hillier, 1999).

In Évora, urban centralities began to emerge after the transition from a radial to a radial-concentric structure (still incomplete). Urban forms arising from early radial developments, namely, traditional historical center road links to different gates around the walls benefit from a radial-concentric road structure. It is the natural consequence of the historical growth pattern and contributes to the balanced distribution of urban centralities in the urban space. Multiple syntactic properties with high- or high-medium figures appear simultaneously in all the identified urban centralities during the time periods in which they emerged and in the last consolidation period.

This appears to be very important for preserving the character and historic value of the HC without destroying the balance of urban centralities in the hierarchy. HCs have a natural capacity, given their own architectural value, to retain high value urban centralities.

Special attractive functions, whether they are public initiatives, central government institutions, or private activities, appear to be crucial for sustaining or anchoring urban centralities.

The urban plans for Évora since the 1940s have included a degree of flexibility, reinforced by the different types of plans in the 1980s and the policies that promoted mixed activities and land uses from the 1990s onward, and have laid the groundwork needed for planners to take on the complexity of urban evolution.

The HC of Évora still continues to be the heart of the town, according to the typology established by Troitiño Vinuesa (2003); it is the city’s administrative, commercial, and cultural center. The ring road that runs along the HC walls has played, and continues to play, a key role in the urban system of Évora.

Planning policies for the HC and for the town as a whole are interdependent, especially with respect to the urban area close to the walls, which forms a transition ring and is home to many activities that are complementary to those in the HC. Any planning process that would tend toward decentralizing functions should be analyzed very carefully.

Improvement of the public transport system stimulates the centralities network and enhances the locational quality of the HC.

A revision of the future Master Plan may benefit from these results and use those factors that explain the emergence of urban centralities to balance the attractiveness of the HC, while respecting the overall urban system of Évora. Changes in HCs are inseparable from the urban development of a town as a whole. Interdependency and synergies that link newly emerging areas of expansion and their urban centralities to the old HC cannot be ignored.

ArcGis software was used for geo-referencing data relating to population, land use, and street networks. Axial maps of Évora were generated using digital cartography with AutoCad software, updated with satellite and aerial imagery. Depthmap software and its analytical tools were used to perform a set of spatial network analyses.

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