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ORAL PRESENTATION

### Title

Who's who in the Spanish archaeology businesses? A roadmap to understand relationships

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Innovation system, interactions, culture, archaeology



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## Research topic and objective

The rising socioeconomic importance of the cultural sector and related businesses is explained by its increasing participation in employment and value creation (Florida, 2005), in addition to its intrinsic social value. Indicators regarding the cultural sector show that 1.7% of the total employed population in the European Union worked in these activities in 2009 and more than half of the working population in the cultural sector has a university degree (European Commission, 2011). This data characterizes a highly qualified sector that raises the interest of the scientific community. Recently, different studies have explained the strategic importance of the cultural sector, including how it creates knowledge, value and innovation (Potts, 2007; Lazzereti, 2003; Wilson and Stokes, 2005; Miles et al., 2008; Bakshi and Throsby, 2010).

Within the cultural sector, the archaeological sector has scarcely been addressed from the point of view of innovation studies, despite the importance that cultural heritage has in European countries. In the Spanish case, the archaeological businesses has had an extraordinary development after 1985 due to two facts: a) the enacting of a law about protection and promotion of cultural heritage (the Spanish National Heritage Law), which states that the Government can give the authorization for some public work but requires a previous report about its archaeological impact; and b) the construction boom in Spain during the first six years of the 21<sup>st</sup> century, which resulted in an exponential increase in the demand for such reports. This context strengthened the creation of numerous archaeological firms, which offer different specialized services in archaeological heritage management (documentation, intervention, enhancement, consultancy and dissemination activities). Thereby this resulted in the emergence of a specific sector that has been described as a sectoral innovation system (Malerba, 2002), in which the percentage of firms interacting with others (suppliers, competitors, other firms, universities and public research organizations, public administrations, etc.) is higher than that in their economic field (technical services to businesses and companies in R & D) (Parga-Dans et al., 2011).

The aim of this paper is to analyze in depth these interactions and to understand with whom and in which kind of activities the archaeological firms collaborate. Finally, we discuss how recent contextual changes -abrupt decrease of public works and construction activity- are driving transformations in the type of services and interactions of this emergent sector affecting its dynamic (Carlsson et al., 2002).

## Data & Methodology

Taking the archaeology firm as unit of analysis, we explore interaction mechanisms to understand how they establish the relationship with different agents of sectoral innovation system. Interaction mechanisms include both formal and informal ones.

To analyze the interactions we have combined case studies, interviewing key industry players (businesses archaeology, public administration and construction companies and energy) with quantitative results from an original survey-based firm-level dataset in 2009. Information about the archaeology businesses and related entities came from professional associations, SABI database, blogs, webpages, advertisements and, finally, the snowball technique was used in order to complete the archaeological map of agents involved in the system. In 2009 we recoded 273 active archaeological firms in Spain. 217 firms answer the survey through vis-à-vis interviews, which means a high response rate (79.5%). The questionnaire covered aspects related to characterization of the sector and the firms, the interaction mechanisms for incorporating and producing knowledge, both formal and informal, and the type of agents with which firms interact.

The analysis is mainly based on qualitative analysis reinforced by quantitative results. As part of quantitative methodology we develop a factor analysis in order to group the mechanisms through which firms collaborate. Additionally, a regression analysis (OLS) shows how the type of agents for the collaboration influences these mechanisms. To control the heterogeneity of the archaeological firms, the model also included firm's age, size and turnover.

## Results and discussion

On average, archaeological firms are young (less than ten years since their creation), small (5.5 employees), have high qualified employees (71% of employees have third level of education where 16.2% are PhDs) and very interactive, with 82.9% of the sample having developed activities in collaboration. Table 1 shows descriptive results for the relation between mechanisms and agents to collaborate.

**Table 1. Collaboration mechanisms and agents**

	Joint actions	Technical assistance	Joint publications	Acquisition of materials and equipment	Services presentation, design and commercialization	Training of personnel	Development of technical and methodological guidelines	Obtaining funding	Total
<b>Competitors</b>	<b>83 (67,5%)</b>	<b>70 (59,3%)</b>	54 (60,7%)	30 (61,2%)	<b>28 (65,1%)</b>	19 (57,6%)	<b>17 (60,7%)</b>	7 (41,2%)	<b>105 (48,4%)</b>
<b>Universities</b>	71 (57,7%)	63 (53,4%)	<b>62 (69,7%)</b>	26 (53,1%)	22 (51,2%)	<b>24 (72,7%)</b>	11 (39,3%)	<b>9 (52,9%)</b>	<b>94 (43,3%)</b>
<b>Other firms</b>	61 (49,6%)	<b>70 (59,3%)</b>	41 (46,1%)	<b>33 (67,3%)</b>	<b>28 (65,1%)</b>	22 (66,7%)	<b>16 (57,1%)</b>	11 (64,7%)	87 (40,1%)
<b>Public administrations</b>	46 (37,4%)	48 (40,7%)	42 (47,2%)	21 (42,9%)	16 (37,2%)	14 (42,4%)	<b>15 (53,6%)</b>	8 (47,1%)	60 (27,6%)
<b>Suppliers</b>	31 (25,2%)	33 (28,0%)	24 (27,0%)	29 (59,2%)	19 (44,2%)	16 (48,5%)	7 (25,0%)	9 (52,9%)	45 (20,7%)
<b>Research institutions</b>	33 (26,8%)	34 (28,8%)	28 (31,5%)	14 (28,6%)	11 (25,6%)	12 (36,4%)	11 (39,3%)	8 (47,1%)	41 (18,9%)
<b>Professional associations</b>	24 (19,5%)	25 (21,2%)	20 (22,5%)	11 (22,4%)	13 (30,2%)	6 (18,2%)	11 (39,3%)	4 (23,5%)	30 (13,8%)
<b>Total</b>	<b>123 (56,7%)</b>	<b>118 (54,4%)</b>	89 (41,0%)	49 (22,6%)	43 (19,8%)	33 (15,2%)	28 (12,9%)	17 (7,8%)	

NOTE: The biggest percentages in each collaboration mechanisms are in bold. Total percentages, column and row, are calculated over total. Percentages do not sum 100% because one firm can choose more than collaboration mechanism and interaction agent.

Table 1 shows the heterogeneity both in the type of agent which collaborate and the mechanism. Case studies have provided detailed information about the importance that working with the different agents signifies for archaeological firms. These agents are part of the archaeology business value chain:

- Their competitors, usually in joint actions to achieve the critical mass required to undertake major projects as revealed interviews. They are the main agents chosen; where almost half of the firms claim collaboration with them.
- Universities and public research organizations. As interviews show, these firms collaborate with two types of researchers: on one hand, groups of archaeology, art or history specialists in the topics identified in the excavations, to improve their capacity to do the identification and delimitation of heritage elements, the documentary studies, as well as to have access to new methodologies used for impact evaluation. Moreover, with different types of materials, chemical and biological laboratories, to identify or characterize the findings, their dating, etc. 62.2% of the firms collaborate with the scientific sector (universities or public research organizations).
- Clients and / or other firms or entities that require archaeological services. This group includes construction companies, energy (wind farms), cultural management entities (which may be public or private) as well as other companies with complementary skills, for example, those in charge of restoring monuments, environmental services, architecture, etc.
- Public administrations are important agents to collaborate with developing a dual role as client and as supervisor.

- Providers and suppliers, which include companies of software, computer engineering, topography, photography, 3D, etc.
- Professional associations: It was just found a strong association in the area of Catalonia, a region which worked for the development of the profession establishing rates and prices, developing procedures to share skills, performing joint projects and developing joint services.
- More recently collaborating with museums and other institutions that preserves and values the cultural heritage and also with other entities, as educative ones or the general public, thus finishing the construction boom, demand that archaeological impact assessments has given way to the recovery of archaeological spaces and to valorize materials found in the excavations.

In relation with the types of mechanisms, joint actions and technical assistance are the most common (56.7% and 54.4% respectively). There are also differences between the type of agent and the interaction mechanism. Scarce number of firms collaborates to obtain funding for innovation; one interesting outcome for innovation policy, as the interviews revealed that these companies do not go to public calls in part because the characteristics of their projects do not fit the program requirements.

Data reduction by means of factor analysis leads to the identification of two main interaction mechanisms: knowledge and other resources incorporation and joint actions. The main differences between them are the resource's direction and interaction's objective. While the first is unidirectional, joint actions present a bidirectional exchange where archaeological firms and other actors are working together in achieving the goal. The complexity of the sector does not allow a clear differentiation between all the items included in factor analysis. For example, development and technical methodology guidelines and acquisition of materials and equipment define both interaction mechanisms. Work in progress uses these results and show differences between the selection of agents to collaborate and the mechanisms to establish this interaction.

### **(Expected) conclusions**

Our work looks for establishing the roadmap of archaeological firms' relationships taking into account both the agents to interact with and the types of mechanisms.

We identify that this sector has a high level of interaction with different kind of agents of the innovation system to obtain resources, knowledge and complementary skills to better provide their innovative and highly demanded services, especially with competitors, to have the capacity to carry out big projects, which represents a unique finding.

From the viewpoint of the dynamic system innovation we have found that the recent contextual changes are affecting the nature of services provided by archaeological firms as well as the type and lead of interactions due to demand evolution.

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