ISSN: 2456-9348
Vol (02) _Issue (01) Impact Factor: 4.520

iJETRM
International Journal of Engineering Technology Research & Management

CLUSTERING TALES FROM THE GREEK CONSTRUCTION SECTOR: LESSONS FROM EXPERIENCE

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ABSTRACT
The idea of increasing regional and national economic competitiveness through the implementation of cluster strategies is not something new. In each business sector, in each country, the creation of clusters has been used to capitalise on sector characteristics and address country specific productivity needs. While clusters have met with significant success in many context, the Greek context and in particularly the Greek Construction sector has not been so fruitful. This paper, through the development of a conceptual framework, questionnaires with 92 firms and interviews with 10 key firms, sought to investigate the critical success factors for the creation of a cluster within the challenging context of the Greek construction sector. Using evidence of good practicefrom other European countries facing similar challenges and the empirical data, the findings indicated a series of factors which firms could adopt, mitigate against or manage to help improve the potential success of the cluster. The findingstherefore have important implications for interventions not only by the state and local authorities that will encourage construction firms to participate in a cluster, but also by the managers/owners/practitioners for the creation of the required foundations for their participation in an environment where competitors cooperate.

Keywords:
Cluster, CSFs, construction firms, Greece

INTRODUCTION

Companies all around the world struggle to find the right balance between various organizational structures that will allow them to implement innovation and thus improve their competitiveness.Often this involves seeking strategic partnerships or striving for agile and flexible structures. The construction sectoris a good example of such a sector. It consists of a number of entities that have to be synchronized in order to deliver the end product. Hence cooperation and synchronization of strengths is a necessityfor the dynamic environment in which it operates (Yfanti et al., 2017). Furthermore processes of production, distribution and consumption are changing in such a manner that new facilities are needed for extraction of raw materials, processing, manufacture, retail and service sector activities (Gann and Salter, 2000; Brown R., Nguyen T., 2015). As such, and fuelled by technological development, construction firms are increasingly being challenged to successfully innovate in order to satisfy the aspirations and needs of society and clients, whilst improving their competitiveness (Yfanti et al., 2017).

Innovation however is not something that just happens inside an organization, it occurs in the level of a company's interaction with regulations, institutions and norms within which it operates. As such, innovation can emerge from various sources of activities and collaborations.Although the generally accepted perception of the construction sector views innovation as a rare occurrence, in reality it occurs consistently throughout the sector(Slaughter, 1998)andoften requiresthe modification and the adjustment of the theoretical models to the sector's specificities (Seaden and Manseau, 2001). Construction facilities are large, very complex, and long lasting. They are created by a temporary alliance of sometimes disparate organizations within an explicit social and political context (Slaughter, 1998) driven by a net of open collaborations (Damaskopoulos, 2003).

Consequently,and as innovation is the key to a firm's competitiveness and improvement(Payaro, 2003), the way towards innovation could be clustering (Solvell, Ketels and Lindqvist, 2009; Gumilar et al, 2009, Yfanti et al., 2017).

When Marshall approached the economy process from a territorial perspective he did not expect such significant consequences applied in economic research.According to Boix and Trullén (2010), he opened up the possibility of finding different ways of approaching industrial development based not only on a vertically integrated industry but in small and medium sized firms in the growth of external economies, and with openness to international competition.Thus Marshall and lateronBecattini and Porter are the principal points of reference in the field of clusters (Gascón et al., 2010). To define a cluster nonetheless is not a simple task as the concept is used for a variety of different business structures and purposes (europe-innova.eu, last entry Feb. 2014). Its multidimensional character poses problems of theoretical and empirical definition, as well as methodological investigation (Yfanti et al., 2017).As the context of our research is clusters within the construction sector, the term cluster is seen as "a geographically confined collection of firms (undertaking construction sector activities), knowledge producing agents, suppliers, customers, financial actors and state organizations based on an existing network" (Yfanti, 2015; Yfanti et al., 2017).

Having established a definition for construction clusters the next question that rises is if the creation of one is always feasible within any context. According to Thissen et al. (2013), regions economically differ from each other. They compete in different products and geographical spaces, exhibit different strengths and weaknesses, and provide different possibilities for growth and development. Thus what fosters growth in one region may hamper it in another (Thissen et al., 2013). On the other hand, the Lisbon Strategy of the European Communities Commission (2000) considers the advancing countries of Europe as the critical factors for making the European Union (EU) the most dynamic and competitive knowledge based economy. Thus Greece presents a very intriguing context area for construction firms given the fact that it is an advancing economy (based on the European Bank for Reconstruction and Development definition) in the EU area. Thereupon, investigating the construction sector in such a context in order to comprehend the factors that hinder the creation of a cluster is an addition to this area of research.

LITERATURE REVIEW

According to European Commission the construction sector is affected to a large extent by several legislations concerning the protection of the environment, energy efficiency, safety at work, social security, VAT, liability regimes, and public procurement. Even within such a demanding framework constructions generated 10% of gross domestic product (GDP) in the European Union in 2015 and provide 20 million jobs (EU Commission, 2015). At the same time the competitiveness of the construction sector also depends on research and innovation activities, which aim to face challenges like globalization of the markets, economic and employment growth, energy and climate change, demographic changes, social cohesion, safety and health of the citizens (ec.europa.eu, 4-10-2016). These along with the suggestions of several researchers like Reichstein et al (2005) that construction firms are heavily reliant on specialized and institutional sources of innovative ideas, promotes the need for the creation of a fruitful area that will allow innovation to be spread within the Greek construction sector, that has been so harshly affected since the 2009 economic crisis. One of the ways for a firm to adopt and implement innovation is within a net of open collaborations (Damaskopoulos P., 2003), such as of a cluster (Solvell et al., 2009; Gumilar V. et al., 2009), as collaborating can also deliver to a construction firm significantly improved quality and value (Barret P., Sexton M., 2006).

Clusters are based on complex relationships among involved partners (Matopoulos et al., 2005). These relationships can be built on common or complementary products/services, production and distribution processes, core technologies, resource requirements, logistics, education, training and outsourcing services support. As the construction sector has been strongly determined by local tradition and culture, and geographical factors such as availability of material and climate, relations similar with those required for the creation of a cluster and previously mentioned, could become the ground floor for a cluster to flourish. The extent to which the cluster's approach is appropriate, realistic and flexible enough to achieve the goals of a construction company, struggling to survive in a troubled European country, and hence to become an achievable approach remainsto be examined and are the focus of this paper.

When it comes to the contents of a construction cluster, all countries are fairly similar, covering industries such as material, machinery and equipment, real estate and government procurement (VerbeekHessel, 1999). However based on Verbeek's cluster analysis results for five OECD's countries (Belgium, Denmark, Finland,

Netherlands and Spain) findings point out that each country's construction cluster differs based on its sector's orientation. For example in Belgium the construction cluster is closer to the energy sector while in Finland closer to the forestry sector. Thus in each case the resilience in the context of increasing globalization differs (Elola et al., 2013) as each nation concentrates on different aims. Nonetheless and according to Feldman et al. (2005) even though the history of each cluster – including the early conditions and individuals involved – may be unique, there are policy prescriptions that can be discerned from examining commonalities in the path of cluster development. Shading therefore more light on the obstacles that may be found along this path is very important (Kocker G. et al., 2008) and is this research's objective, as the formation of a construction cluster increases the possibility to improve the level of manageability of construction complex and effectiveness of interaction of economic subjects with the perspective of transition to an innovation path of development (Gladkaya E.A. et al., 2017).

RESEACRCH CONTEXT

As already mentioned this study is located within a specific national setting of Greece. As such, it is important to examine not only the macro-environment in which Greek construction firms conduct their business, in order to identify the wider socio-economic forces that shape firms' business strategies (Ramirez-Aleson M., Fleta-Asin J., 2016; Panagiotakopoulos, 2009), but also to point out that the geographical location of the country, its unique culture and surroundings are not only of great importance as the social and political context (Jenkins H., Hossain M., 2017; Gallardo R., Stich B., 2013; Camagni R., Capello R., 2013; Cortring J., 2006) and policy formulations (Hoelett M. et al., 2016; Giljum S. et al., 2016; Lenchuk E., Vlaskin G., 2010), are typical of other Mediterranean European countries. Thus the geographical separation of the 13th administrative divisions by mountains and the sea indicates the cooperation difficulties that Greek construction companies have to face. At the same time and based on El.Stat. data on Greek manufacturing is typified by low contributions from sectors of high added value or information and communication technology (ICT), based mostly on "traditional" sectors (textile, clothing, food and beverage).As such, and according to the EU Innovation Scoreboard 2017, all manufacturing sectors in the country have innovative performances well below the EU15 average, probably a result of very low R&D expenditures as well as limited innovative activity (Protogerou A. et al., 2017; Komninos and Tsamis, 2007). Additionally and based on the Operational Programme Competitiveness and Entrepreneurship, 2007-2013 as extended for 2014-2020, an overall deindustrialization process can be recognized, with a decreasing trend as to the number of units and employment. On the contrary, the services sectors reveal more positive results.

Within this context comprehending the financial performance of the Greek construction sector over the last twenty years, will make apparent the importance of this research, providing evidence for the significance of the factors that could hinder a construction firm to turn towards clustering, a multi beneficial approach, when the economic environment is very fragile. Hencethe pick of the Greek construction sector were the years preceding 2004 Olympic Games (which will be used as the base year for this research), as the Greek economy grew by nearly 4.0% per year between 2003 and 2007. However the economy went into recession in 2009 as a result of the world financial crisis. Based on Erawatch (country reports 2011: Greece) the country's severe debt crisis in 2010 led to a bailout agreement with the IMF, the ECB and the European Commission, followed by a stringent austerity and consolidation program which in turn brought about cuts in public expenditures and investments. These cuts, together with projected tax increases and the persisting impact of the international financial crisis, led to a 3.5% decline of the GDP in 2010, and a further downturn of 6.8% in 2011(El.Stat.) with this decline to prevail still as a trend till 2017. The dramatic deterioration in the Greek economy is officially attributed to the "freezing" of public and private investment, and the contraction of consumer demand. This led to the general collapse of the Greek construction sector as shown in figure 1.

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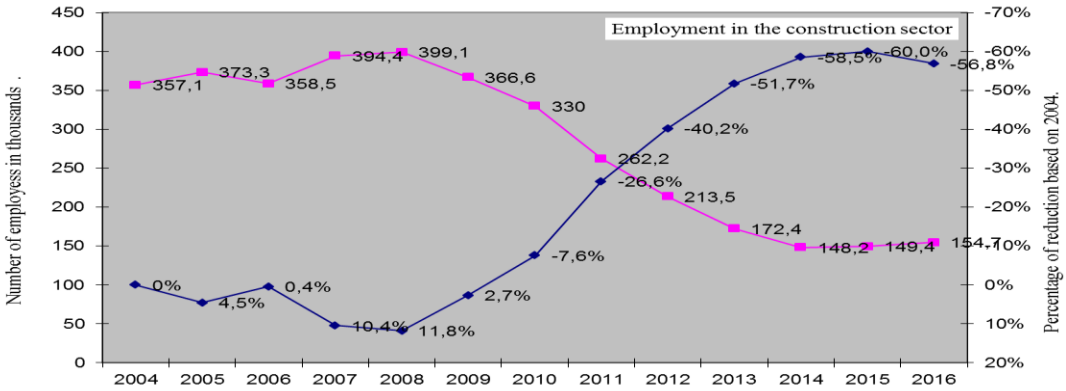
Figure 1: Number of employees in construction sector (in thousands) (original in colour)



Source: Author based on El.Stat. data 2016

Within this difficult economic context, and with the memorandums and application of new laws, the Greek construction sector faced two main categories of problems: (i)institutional frameworks governing the production of public and private projects with significant complexity and overregulation, characterizing the lack of National Planning and long delays in implementation of the National Cadastre; and (ii) the competitive conditions in the Greek construction market, i.e.the acute and sometimes unfair competition on the market and the big discounts on auctions of public projects. The solutions to these problems are the focus of this study and relate to new perspectives on the construction sector (created by the passing of the law for collaboration between the public and private sector) and independent action by companies, namely clustering of activities.

Greek clustering efforts

As far back as 1890 Alfred Marshall recognised that cities' high concentration of people led to two big benefits: lower costs and smoother flow of information, skills and ideas (Hanna K., 2017). Consequently clustering is the phenomenon whereby firms from the same industry gather together in close proximity, as a means for all participant companies to enjoy economies of scale, along with the neighborhoods pool of expertise and skilled workers, an easy access to component suppliers and improved information channels (Hindle T., 2009). Clustering efforts and initiatives therefore contribute to the development of business competitiveness by the realization of improved potentials based on effective cooperation between the cluster's members (Albekov A.M. et al., 2017).

As a result and in agreement with academic findings for increasing firms' efficiency and in the same time achieving the goals of regional development in economic, social and ecological spheres (Frank E.V. et al., 2016) the last fifteen years Greek government have accepted the add value of clusters. Table 1 presents a summary of the Greek clustering efforts after 2005 from when Greece had no systematic, explicit, formal cluster policy until now - 2017.

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Table 1:Clustering attempts in Greece

Year	Action	Results
2005	Scattered actions	No formal records
2006	Corallia – Athens (Knowledge intensive sectors)	* Strengthened the linkages between users and suppliers * Identified opportunities to turn to more knowledge intensive activities * Fostered knowledge transfer by bringing together the required actors * Created new jobs / firms and the base for new clusters
2007	RegCon – Crete (Construction sector)	* Promoted the idea of clustering within the sector * Brought together the research institution with the construction firms * Failed to create a construction cluster in Crete
2011	Ministry of Economic Competitiveness and Shipping, "Business cooperative formations – Clusters"	* Twenty seven projects were materialized * The mandatory participation of local authorities in these proposals was a deterrent
2013	Cretan Energy Cluster	* Promoted renewable energy sources within the island of Crete * The cluster did not thrive, rather fainted away through the years
2014	Cluster of Bioenergy & Environment of Western Macedonia	* 34 companies within Business Services, Education and Knowledge creation, Environmental Services * Results N/A
2016	Chorus Cluster	* Fifteen companies within environmental services * Results N/A
2017	National Strategic Reference Framework	- N/A

Source: Author

Prior to 2005 a few scattered pilot projects were launched towards cluster creation or development. These mainly emphasised the promotion of SME's cooperative networks through projects rather than creating clusters in an organized sense. The first of its kind, explicit, well organized, systematic, strategic (with long-term scope) national cluster attempt was the Hellenic Technology Cluster Initiative (HTCI) which was initiated in April 2005.

Then in 2007 RegCon,anEU financed project (7th Framework Programme 2007-2013),made the first effort for the creation of a construction cluster in Crete. RegCon's aim was to promote the R&D based clustering idea within the construction sector and focus on the benefits that will derive out of it. It was also considered essential to bridge the gap between the construction enterprises and the research institutions. The Cretan Chamber of Commerce was called to play a leading role to the cluster development (as the state's representative in Crete), not only to effectively participate but also to disseminate the idea of it. In 2009 the RegCon project ended and even though the development of a construction cluster in Crete did not flourish within its timetable, the first steps within the construction sector for gaining conscience of the cluster concept were made.

In 2011 the Ministryof Economic Competitiveness and Shipping announced the Notice for the program "Business cooperative formations – Clusters" as a part of the National Strategic Reference Framework. The program's aim was to develop business clusters to stimulate the Greek shipping and manufacturing sector, as according to the Ministry's web site, "in the view of the current economic crisis clusters can be crucial for the survival of the Greek enterprises". After two years, a study conducted by Tzenou et al. (2013) for the National Documentation Centre, revealed that Greece had participated in the Project Regions of Knowledge (REGIONS) for period 2007 to 2013 and generated 27 projects. From them seven (25.93%) came from Crete, highlighting once again its significance as a region. However, based on the study's findings the mandatory participation of

local authorities in the proposals was a deterrent to several groups, which were not familiar with such collaborations in the past (Tzenou et al., 2013, pp.49). As such, in 2013 the creation of the Cretan Energy Cluster (with 10 companies at its core) was announced as an initiative by the Heraclion Chamber of Commerce with the overall goal of promoting of renewable energy sources within the island of Crete by the creation of a triangle relation between relevant companies, research institutions and the state. Thiscluster effort also failed due to a lack of commitment on their attempt, along a lack of consensus of what is a cluster, which eventually led to the increase of hesitation for further cooperation between the participants.

Despite these failures, in 2017,the new National Strategic Reference Framework attempted to boostthe creation of clusters within the Greek context acknowledging the fact that they can maximize a firm's dynamics, range, productivity and effectiveness (Doras, 2016). Even though clusters' benefits could truly assist Greek construction firms it seems that in practice, something is missing and current theory remains ineffective.

As such, and recognising the need for an entire sector's on-going attempt to come out of the crisis, especially when the traditional methods of diversification no longer provides a return (Lenchuk and Vlaskin, 2010)we seek to investigate the scenario of a long term growth of the Greek construction sector's competitiveness through the transformation of innovation factors into major source of a construction firm's growth. Therefore the creation of a coordination system between the state, business, science, and education on the basis of use of effective instruments for innovation development could help to this direction (Trkman, 2010). Consequently the use of the cluster approach as the appropriate instrument (Hemert et al., 2013) for achieving the above is of great significance.

This finding has given the impetus for the realization of this research as the investigation of the factors that hinder construction companies to join a beneficial partnership is of outmost importance for overcoming the obstacles that prevents both a construction firm to achieve its goals and also the overall national clustering policy.

THE FORMATION OF THE QUERY

Having established the need for innovation within the construction sector and the fact that a traditional sector like the construction sector could be severely influenced by an economic crisis (like in the Greek case)and acknowledging the benefits deriving from a firm's participation in a cluster(Account Ability and UNIDO report '06; DIBiC project, Interreg IIIC; Lenchuk and Vlaskin; McPherson Lisa; CeeD – UK, Scotlandetc.),along with the weaknesses of a cluster approach (Cortright, 2006; OECD, 2007;Gascón et al., 2010; Table 1), this research accepted Chapain et al. (2010) findings that "Building clusters from scratch should be avoided. Instead a research of any latent clusters hidden in regions or localities would benefit from networking and awareness rising",as the basic idea behind the study. Also potentially wasteful "one size fits all" strategies for clusters that don't pay sufficient attention to the distinctive needs of different sectors should be avoided.So in what way should this query be approached and which research path should be followed for the purposes of this study?The literature review established several key studies in the field. These studies argue their used strategies and methods, their sample and their analysis.

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Table 2: Methodological approaches

Area	Source	Strategy	Method	Sample
Innovation	Aksorn T., Hadikusumo B.H.W., 2008	Case Study & Survey	Questionnaire	80
	Barret P. & Sexton M., 2006	Case Study	Interview	4
	Caerteling et al., 2006	Case Study	Interview	2
	Cedeno et al., 2000	Survey	Questionnaire & Interview	10
	Cedeno J.E., 2000	Survey		10
	Clarke A., 1999	Case Study	Observation	1
	Gopalakrishnan S. & Bierly P. , 2001	Case Study	Questionnaire	101
	Gordon M. et al., 2010	Case Study	Questionnaire	28
	Ling F., 2003	Survey	Questionnaire	58
	Lu X.H. et al., 2006	Case Study	Questionnaire & Interview	40 & 16
	Manley K. et al., 2008	Case Study	Interview	4
	Manley K. et al., 2009	Survey	Questionnaire	1317
	Seaden G. and Manseau A., 2001	Case Study	Questionnaire	15
	Tolga.Ilter A., Attila Dikbas	Case Study	Interview & Observation	2
Cluster	Berg S.H. 2014	Case Study	Interview	35
	Dikmen I. et all., 2009	Survey	Questionnaire	136
	Enright M., 2000	Survey	Questionnaire	160
	Feldman M. et al., 2005	Case Study	Interview	
	Giuliani E., 2003	Case Study	Questionnaire & Interview	64
	Martin H., Coenen L., 2014	Case Study	Interview	
	Matopoulos et al., 2005	Case Study	Questionnaire	
	Tambunan T., 2008	Case Study	Interview	
	Tavassoli M. H., 2009	Case Study	Interview	
Construction	Barret P. & Sexton M., 2006	Case Study	Interview	4
	Bing Li et al., 2005	Survey	Qestionnaire	61
	Blindenbach-Driessen's and Ende's, 2006	Case Study	Interview	21
	Caerteling et al., 2006	Case Study	Interview	2
	Dainty et al., 2003	Case Study	Interview	20
	Dulaimi et al., 2002	Case Study	Qestionnaire	200
	Gann D.M. & Salter A.J., 2000	Case Study	Interview	30
	Harty C., 2005	Case Study	Interview	
	Iyer K.C. & Jha K.N., 2005	Survey	Qestionnaire	112
	Lim C.S. & Mohammed Z., 1999	Survey	Interview	40
	Ling F., 2003	Case Study	Qestionnaire	58
	Lu W. et al., 2008	Survey	Qestionnaire	92
	Manley K. et al., 2008	Case Study	Observation	5
	Manley K. et al., 2009	Survey	Qestionnaire	1317
	Morris P.W.G. et al., 2000	Case Study	Questionnaire & Interview	117 & 20
	Ng Thomas S., Tang Z., 2010	Survey	Qestionnaire	64
	Ng Thomas S.et al., 2009	Survey	Qestionnaire	73
	Phua F.T., 2004	Case Study	Interview	29
	Reichstein T. et al., 2005	Survey	Qestionnaire	2621
	Seadon & Manseau, 2001	Case Study	Qestionnaire	15
	Toor S.R. & Ogunlana S.O., 2008	Case Study	Questionnaire & Interview	76 & 35
Small & Micro Firms	Barret P. & Sexton M., 2006	Case Study	Interview	4
	Barret P. et al., 2008	Case Study	Questionnaire & Interview	7
	Caerteling et al., 2006	Case Study	Interview	2
	Hadjimanolis A., 2000	Case Study	Interview	25
	Lee S. et al., 2010	Case Study		1
	Manley K. et al., 2008	Case Study	Observation	12
	Matthews Judy, 2002	Case Study	Interview	5

Source: Author based on literature review written in alphabetical order

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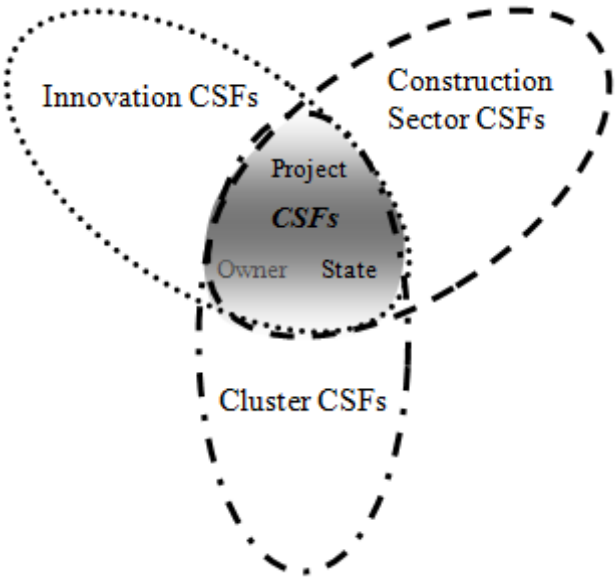
Table's 2 findings clearly points out that the most preferred strategy for all four key areas was case study. According to Cortright (2006), even though case studies appear to have an important disadvantage (by promoting the idea that imitating will lead to the same results), they also appear to be more accessible to the lay reader than most academic work.By addressing many of the different dimensions of the researched industry/sector simultaneously, case studies provide a more balanced view of the various situations. Also both questionnaires and interviews are used as data collection tools. However in some cases, where the sample is small, researchers prefer to combine questionnaires and interviews for strengthening their results. Consequently Table 2 provides a justification of this research's choices and evinces the appropriateness of this study's chosen research method (mixed method approach) and strategy (case studyrelied on multiple sources of evidence both quantitative -questionnaires and qualitative – interviews).

METHODOLGY

This research'sfocus area was Crete, Greece's biggest island and a fair indicator of the Greek context and culture with all the necessary human resources, material infrastructure, academic and research institutions and state representation. The research design was developed based on the literature review findings in Table 2 and by further investigating literature concerning clustering and innovation, and has four phases:
(1) Preliminary (literature review).
(2) Field work (data collection and analysis).
(3) Modifications (collation and alteration).
(4) Re-evaluation of the results combined with other similar studies within the same context.
A conceptual framework was applied (see figure 2). The framework was based on the identification of several critical success factors (CSFs) regarding clustering across the two axes previously mentioned; the state and the firm along with a third dimension which is the core of the construction sector; projects,and pointed out that implementing and maintaining a cluster approach within the construction sector is something multidimensional and thus determined by a number of factors that could nonetheless be regarded also as the expected derived benefits from a firm's participation in a cluster. Consequently figure 2 presents the conceptual frameworkupon which the research was based and which depicts the idea that "if these various CSFs concerning innovation, clustering and the construction sector coincide with the benefits derived from the firm's participation in a cluster then a construction firm would be more willing to make the step towards clustering and thus towards an approach that will allow it to easier foster innovation".

Figure 2: Conceptual figure "Elikas"



Source: Author

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The above figure presents the area where the three types of CSFs (innovation, construction, and clusters) are cross linked with their three origins (Project: P,Owner: O, and State: S). Theresearch foundations are thereforepresented within the grayarea. Consequently the dotline represents CSFs concerning innovation implementation, the dash-dot line represents CSFs concerning clustering, while the dash line represents CSFs concerning the construction sector.The completion of the first two phases led to the creation ofseveral lists of factors. However no fixed rules has been developed for the identification of CSFs (Weisheng L, et al.,2008). Hence and despite the wide acknowledgment of the factors approach in past studies for the extraction of the most important factors for the completion of this phase and based on Weisheng findings, a full set of selected success factors were identified, calculating each factor's importance index value based on the research data, leading thus to the extraction of the most critical ones, from the pool of factors.Table3presentsthe derived CSFs based on their source according to figure 2.

Table 3:Conceptual Framework

	Critical Success Factors
P	Existence of a framework for information storage and sharing
	Existence of the right team (skills, motivation, experience)
	Risk containment (contracts, responsibilities, accidents)
	Effective procurement
	Define the need (problem) and justify the change
	Team's (subcontractors') ability to cooperate, trust and communicate
	Early definition of project's (clear) goals
	Level of accepted quality
O	Ability for resource allocation
	Technological and knowledge dynamics
	Stability of vision and commitment
	Ability to manage change
	Ability for performance monitoring
	Ability to trust
S	Creation of a platform for dialogue and cooperation between industry and academia
	Creation of regional specialization
	Economic support (loans, taxation, insurance)
	Creation of supporting infrastructure (transportations, electricity lines)
	Legislative stability

Source: Author

During the third phase of the research both quantitative and qualitative data was gathered. The sample frame represented a six months period and covered the area of Crete a population of 420 construction firms. After recording the quantitative data and having converted the conversation from in-depth interviews into data, content analysis was performed andkey themes identified.During phase Three these key factors were collated and alternated creating hence a detailed picture of critical factors that could either lead a construction firm to participate in a cluster or to stay away from it.

According to Toor and Ogunlana (2008; 2009), the existing lists of CSFs employed by different researchers are typically large and comprise several factors under various categories such as project procedure; external environment; human related factors; project related factors and project management system. However the aim of this research is not to create another list of CSFs and their sources but to shed some light to those factors that are relevant with the construction sector operating in a context area like Greece, or one with similar characteristics, and its effort to create a construction cluster. Thereupon and closing this research a re-evaluation of the derived findings combined with other similar studies within the same context concluded the fourth phase providing thus the reasons for which a cluster approach is undermined, and hence the CSFs for the creation of a construction cluster in the research's context area.

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FINDINGS

First phase's aim was to retrieve secondary data from all available relevant sources concerning the Greek construction sector which could also offer a helpful insight in the idea of clustering in Greece. Thus the Greek construction sector's profile was outlined (mainly composed by SMEs) and a united list of the entire Cretan construction sector's population was created in order to identify the target group (420 construction companies).
The second phase of the research provided the required data for the investigation of this study's aim: quantitative data from the questionnaires (with a response rate of 21.9%) and qualitative data from in-depth interviews (10 construction firms). The converted conversations from the interviews into data were content analyzed and developed into key themes. These key factors that could either excel or hinder the creation of a construction cluster were combined with questionnaires' findings leading thus to the next phase.In phase Three the modification of the proposed conceptual framework based on the findings of the collected quantitative and qualitative data analysis concluded to Table 4.

Table 4:Research findings

CSFs – Project	**CSFs – Owner**
Quality of human resources	Access to finance
Cross companies training	Resource allocation
Existence of the right team (skills, motivations, experience etc)	Awareness of technological and knowledge dynamics by personal further education and training
Effective procurement	Performance monitoring
Risk containment by constructing safe contracts	Management of change – adoption of innovation
Early definition of project's goals	Vision, commitment and persuasion
Define the need (problem) and justify the change	Development of relationships to compete abroad
Existence of a framework for safe information storage and sharing rate	Company's status / trade mark / promotion
Sharing risk for cost reduction	Attraction of investments
Ability to cooperate, trust and communicate by using common codes with other construction firms	
Promotion of joint R&D efforts with subcontractors and suppliers	
CSFs State	
Legislative stability	
Economic support (loans, taxation, insurance) and access to national funds	
Creation of supporting infrastructure	
Availability of specific natural resources	
Adaptation of international tools and standards for local context	
Level of accepted quality	
Creation of regional specialization	
Organization of networking and internationalization events	
Cooperation between industry and academia	
Improvement of public sector's services' quality	

Source: Author

After the completion of phase Three the derived factors were compared with other factors extracted after a thorough examination of several case studies and reports concerning Greece and; innovation strategies (Wharton, 2004; Peroulakis and Dalaboura, 2013 etc); construction sector (Wharton, 2004; RegCon, 2009; Yfanti, 2015 etc); and clusters (RegCon, 2009; HRMD, 2010; Yfanti, 2015 etc). Table 5 presents the combination and comparison as per the fourth phase of the research. This phase attempts to comprehend what would it take for a construction cluster to finally happen within a context like Greece.

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Table 5:Reasons for the inapplicability of clustering in the context area

CONSTRINNONET 2004	RegCon's 2009	HRMD 2010	Peroulakis, Dalaboura 2013	Chamber of Helia 2014	Yfanti 2015
The problem of innovation in construction should **not** be approaced as **a simple solution** [P]	The **heterogeneous and fragmented nature** of the construction sector along with the special characteristic of its labor force act as an anker towards innovation activities [P]	The majority of the firms were **small / family owned** companies with very **limited outsourcing** [P]	**Low comprehension** for innovation's necessity [P]	**Traditional structure**, very **small size** and family owned [P]	Quality of **human resources** [P]
Problematic engagement of construction SMEs with Research and Technology Development (**RTD**) and business development [P]	The sector was **immature** to accept **collaboration between competitors** [O]	**Difficulty** of **understanding** the concept **of clustering** and their advantages [P]	**Low affectation of culture of networks and clusters** [P]	**Lack of skilled personel** [P]	Lack of technological and financial **information flow** [P]
Insufficient data on the construction industry and market at both national and regional level [P]	**Lack of consensus of what is a cluster** and what can offer to its members [O]	Intensive **introversion** [O]	**Deficiency** of **interconnecting** state's overall relevant **strategic** framework **with** each **region**'s [S]	**Low innovation rate** [P]	Deficiency of **access to finance, resource allocation** and **risk sharing** [P+O]
Low SMEs' **awareness** of existed **networks** and lack of access to required information [O + P]	Belief that **clusters** are another **occasional** (without continuity and escalation) **action** of the state [O]	Existence of **hesitation** and wariness due to lack of tangible similar examples **concerning cluster** results [O]	**Limited interconnection of academia** with both the construction market and the firms [S]	**Limited financial** and **technical information flow** [O+P]	Difficulty and hesitation for **cooperation with competitors** [O]
Absence of focus on construction in either **innovation** support initiatives or business development services on regional level [O]	**Limited collaboration** between the regional research institutions and the construction enterprises leads to **limited knowledge dissemination** [S+P]	**Lack of interest** [O]	**Lack of a neutral organization** that would help remove the barriers to collaboration and build the required trust [S]	**Introversion** [O]	Limited awareness of **what is a cluster** [O]
Lack of **business support** which is the most relevant mechanism to promote innovation in the construction sector [S]	**Low availability for investments** as small and micro firms prevail the Greek construction sector [S]	**Mistrustfulness for cooperation** with the competitors [O]	Framework's **bureaucracy** [S]	**Low collaboration culture** [O]	Lack of trust towards **state's support and involvement** [S]

Source: Author based on literature review written in chronological order

From table 5 it can be seen that based on the experiences of the Greek construction sector key learning points emerged regarding factors that hinders the creation of a cluster and its development. On 2004 a formal attempt was made to investigate innovation issues within the Greek construction sector. The need was recorded along

with the sources from which it emerged (Project, Human factor – Owner, State) but the path for adopting an innovation approach remained vague.
This path was later on indicated through the materialization of an EU financed project (RegCon) that tried to connect the missing links between existing networks for the creation of a construction cluster. Once again the same sources provided obstacles that led this attempt to a failure. As a project oriented sector the limited knowledge dissemination led to immature collaboration between potential competitors. Firms' lack of consensus of what is a cluster strengthened their unwillingness to collaborate not only with research and academic institutions but also with the regional authorities. It also lowered their availability for investments, as they faced the cluster as another occasional and with no continuity and escalation action of the state.
The years that followed brought more attempts for the creation of a cluster within the Greek construction sector with no success nonetheless. The same three sources (Projects, Human factor – Owner, State) produced if not the same obstacles, similar ones that hindered the creation of a construction cluster within the Greek context and which are:

- Limited outsourcing
- Low innovation expectations and rate
- Lack of skilled personnel
- Resource allocation
- Lack of consensus of what is a cluster
- Introversion
- Lack of trust
- Limited information flow
- Deficiency of access to finance
- Lack of neutral organization
- Lack of trust towards state's involvement
- Instability of legislation framework and taxation

These factors can be regarded either as the obstacles that prevented, till the moment of this research, the creation of a construction cluster in a European context area like Greece or as the CSFs that should be achieved by a construction company in the same or similar context area in order to participate in a cluster.

DISCUSSION

According to Gascón et al. (2010) in the academic debate, the strongest criticism of cluster policy does not come from researchers that claim that locational factors are irrelevant, but from economic geographers and others that fully support the view that locational factors are important. Some criticize the fuzzy way the cluster framework is translated from an academic idea into a practical policy concept (Martin and Sunley, 2001). Nevertheless, despite technological breakthroughs that have caused the death of distance, it turns out that geography is still important (Karerjit, 2013). The existing differences in geographical, cognitive, institutional, social and organizational structures and networks between regions thus points out that there is a need for different approaches towards innovation based on each region's specific potentials (Marrocu et al., 2013). Expanding this finding not only to each region's but also to each industry's potentials, in order for a construction company to increase its possibilities to participate in a cluster, firms should be able to face and overcome the factors derived from this study's research.
Therefore and based on Tables 4 and 5, as clusters are strongly project oriented organizations and involve projects from different fields (like commercial, R&D, promotional) which are crucial for their development, it is important for a construction firm to have a clear view concerning its projects. The participating companies have to exhibit a true commitment to the work of the cluster, and assign their resources to the projects that they have decided to participate. As the execution of projects by participants from different organizations is associated with more risks than in-house projects, monitoring information flow and relation strengthening should be carried out in order to identify any discrepancies. Hence a construction firm should have the required knowledge (personnel and manager/owner) to apply monitoring mechanisms and techniques.
As information exchange among cluster's members can be a problem (trust issues arise), a cluster demands high quality human resources and teamwork in which numerous tasks and functions are handled by different cluster actors. A certain amount of time should be allocated to understand each other and thereupon to develop mutual trust. Construction firms should be willing to offer that time and to use an offered (by the cluster) information system for defining and classifying the exchanged and shared knowledge. The successful transmission though,

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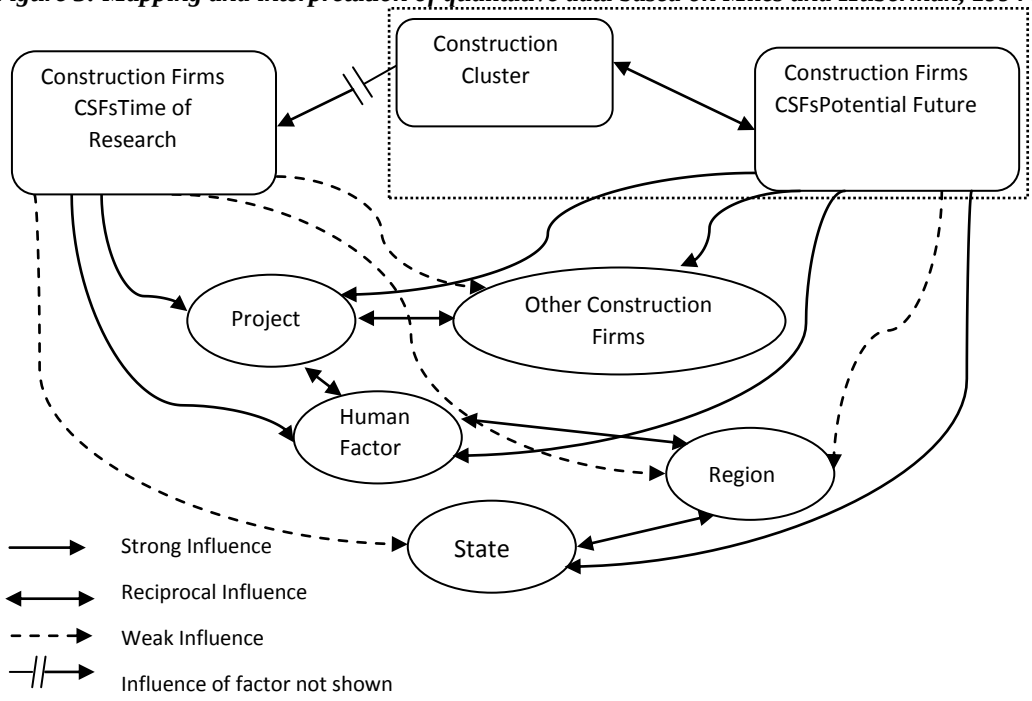
of information and knowledge requires a shared language and a set of common frames of reference (Hautala and Jauhiainen, 2014). Thus the creation of common codes of communication would support a cluster's information system which aims to the achievement of constructive communication of all kinds, group work, document management, limited access, security, and safety, use of different web tools and systems - and also different e-business services. Also project financing and control over the actually incurred investments and costs should be a deep consideration for all cluster members. A construction firm's ability to prepare project proposals and business plan for approaching donor agencies, venture capital firms and other sources of finance through the assistance of a cluster (when required) is important as a high level of transparency would be needed in order to secure that there will be no conflicts regarding money issues. These conflicts can lead to different problems and eventually also to the end of the cluster initiative. Hence a company should have initially the necessary financial resources to follow up.

It is also important for the construction firm's owner/manager to be aware of what it means to be a part of a cluster, as "a strong leadership must talk the talk and persuade the personnel to walk that talk" in order to be able to promote internally and externally the cluster. Also strengthening the spirit of healthy competition between construction firms through cooperation and understanding of the benefits of the cluster are very important factors for the development of the concept in a similar context area.

The derived by the literature conceptual framework along with the findings from phase One constituted the foundations for the development of phase Two. The correlation of fieldwork's empirical data from both questionnaires and interviews with the conceptual framework led to the emergence of phase Three. This phase's aim was to highlight the validity and credibility of the new framework based on the findings of the empirical data and its refinement to an empirical framework. However mapping abstracted webs of meaning often requires creative leaps. Therefore an approach suggested by Ritchie and Lewis (2003, p. 265) was used for presenting not only the derived associations but also the contribution of a cluster to the Greek construction sector in the time of the research and in a potential future. A detailed figure mapping theme interconnections and influence is shown in figure 3.

Figure 3: Mapping and interpretation of qualitative data based on Miles and Huberman, 1994 suggestions



Source: Author

The above figure presents the derived association within four key areas: project, human factor, state and region. This range comes in accordance with figure 2 where a separation of CSFs in three sections is proposed and

based on which the questionnaire was designed. Thus figure 3 presents the outcome from relating the quantitative with the qualitative data that led this research to phase Four and the derived Table 5.

As a partner of the CONSTRINNONET Project ("Promoting Innovation in Construction Industry SMEs", 2004), Greece's conclusions highlighted not only the need for a different approach by the Greek construction sector but also the path that would allow its firms to be supported in either innovation or Research and Technology Development (RTD) brokerage initiatives. The absence of sufficient data, and the need for required information and appropriate business support, led Greek construction firms to search for a new way to obtain them. Such a new approach was proposed in 2009by the RegCon project. Even though the Greek construction sectorseemed to be aware of EU's challenges and opportunities (based on the project's workshops) it also seemed unaware of how to reformulate traditional frameworks and networks in order to face the challenges. The region of Crete specifically seemed to face the high costs of merchandise transport as well as deficiencies in the basic infrastructure which increased the cost of construction. In addition, the fragmented enterprise activity and the small scale economies characterized by a lack of coordinated planning, in the interior and abroad, added to the drawbacks in the sector's development. Furthermore, the large number of small size construction enterprises (based on RegCon's preliminary data) also decreased the investment potential of the sector. However, a previous report of the Ministry highlighted that clustering has to overcome several problems created by the Greek enterprising culture in order to gain in adoption. These included: improvement of its members' economic situation; economies of scale; cooperation between competitors; introduction in new markets; improvement of product quality; new product development and adoption of new technologies through successful actions for technology and knowledge transfer. In addition, Chamber of Helia's in 2014 highlighted that the small and micro Greek businesses operating in traditional industries such as the construction sector faced not only multiple and diverse challenges, but also pressures from changes in the workplace (personnel, materials, subcontractors etc.), in the economic environment (taxation, laws etc.) along with the owner's sifting policy and specific culture.As such, these factors are considered as part of our proposed framework (Table 4) for enhancing the potential of clusters in a Greek context.

This verification however does not seem to be sufficient to overcome the reported inhibitory factors (Table 5). Collaborative culture and co-operation between competitors seem to be almost unapproachable to the Greek construction sector posing hence as one of the first CSFs that a construction company should overcome.

CONCLUSION

The aim of this paper was to investigate the critical success factors for the creation of a cluster within a challenging context like the Greek construction sector and to propose how the factors can be managed to improve the chances of successfully developing a cluster. The research was based on four phases, with the first two phases being based on the literature review and addressed terms like innovation, clustering and the construction sector to develop a conceptual framework based on the recorded net of interweaved CSFs related to these termsand used within the third phase. After its completion the derived factors were re-evaluatedand combined with other similar studies within the same context completing the fourth phase.

Thereupon and on the basis that construction firms have to face several limitations and restrictions like their comparatively weak financial and technological backgrounds and the fast pace of technology development cycles, there seems to be a general agreement the last fifteen years that within the Greek context, and more specifically the construction sector, there is a lack of consensus of what is a cluster and what it can offer to its members. The vague set of principles for delimitation of clusters along with the territorial background and the socio-economical context that the cluster would work seems to further confuses the Greek construction firms.Table 5 presents several drawbacks and bottlenecks that were recorded in different researches and which seem to indicate the cluster approach as inappropriate, unrealistic and not flexible enough to achieve the goals of a construction companystruggling to survive in a troubled European country. In the same time these seemingly negative factors could be positively envisaged as the critical onesthat should be achieved by construction firms in order to participate in a cluster and thus gain all the benefits that a cluster has to offer. Thus this research's findings from phase Three (see table 4) assists in the evolvement of the conceptual framework to an empirical framework which then acts as a recommendation on the way forwards, while table 5 findings offers an insight to potential cluster members and policy makers of what should and could be encountered.

As clusters act as a spatial organization, which can provide a platform for firms in the region to share innovation facilities, innovative ideas and production resources in a closer business network, the use of existing networks would benefit cluster awareness. Also as the political culture of each region is a major limiting factor for the

development of governance structures suitable for cluster based economic development and upgrading (Gallardo and Stich, 2013), governments should examine other policy prescriptions that can be discerned from examining commonalities in the path of cluster development.However according to Hospers and Beugelsdijk (2002), regional success stories cannot be explained by agglomeration economies alone. It will be often the cultural uniqueness of a region that determines the particular course of regional economic development and thus clustering. The social connections among economic actors and the culture of particular places play important role in shaping economic behaviors such as risk taking, cooperation, and information-sharing, all of which are also important to clustering(Cortright, 2006).

Closing we conclude that choosing the right cluster approach is not easy as there is no right approach. It all depends on your intentions and your position. For the creation of a cluster the reference country is of great importance as each country differs in:

- legacy and culture
- theneighbour countries (peaceful or not, rich or poor)
- the regulation system (specific norms)
- the macroeconomic environment

Therefore and in agreement with Camagni and Capello (2013), this survey evinces the fact that the different regional assets of each region, city or territory require a different growth strategy. One size fits all strategies especially when it comes to clusters donot pay sufficient attention to the distinctive needs of different sectors within different contexts (Yfanti et.al. 2017).However and as there are policy prescriptions that can be discerned from examining commonalities in the path of cluster development, by examining different context areas provide more possibilities for a region or a sector to find after all the required per purpose path.

Regions are more and more generally identified as important players in the knowledge-based economy. However, regions don't always know how to exploit their potential. It is usual that even in regions that did not traditionally possesses a strong R&D base, science parks have become very popular policy instruments and their number is constantly increasing. However, regions differ from each other in terms of resources (human, social, technological and financial capital) and other factors of competitiveness including those of cluster externalities, local knowledge spill-overs and other multiplicative effects.

Considering the above along with the fact that the construction sector is a complex and fragmented area that requires special knowledge and awareness of its specificities, if the GreekState wishes to successfully implement a strategy for its renaissance (after the lately registered collapse), policies should be designed in such a way for enabling proper decision making. Consequently the outcome of this research could have important implications for interventions by the state and local authorities that will challenge and encourage construction firms to participate in a cluster - an approach so little exploited by the Greek construction sector. Moreover this research's findings indicate a framework providing thus an opportunity for policy makers to consider the critical success factors that affect the adoption of innovation by the construction company, through its participation in a cluster, formulating hence well-defined and accepted policies by the sector's firms. Thereupon this research contributes in terms of policy.

The second aspect of this study contributing in terms of practice, is by providing the necessary information and knowledge to construction firms' owners/managers and practitioners in order to create the foundations for participating in a cluster as there is a need for a tool that would increase the chances for the Greek construction sector to survive throughout these difficult times and the revival of employment within the construction sector. As there has been limited research in advanced economies in order to identify the necessary preconditions for the creation of a cluster within construction firms, the Greek case study could become an example for other European countries that share and faces similar challenges.

This research has also contributed to theory by providing a new theoretical basis for the identification of CSFs that could hinder the creation of a construction cluster, by policy makers, firms' practitioners and researchers who wish to determine if the achievement of a specific factor could have an impact to the cluster formation.

However the fact that the one who determines the CSFs is the one who shapes the company's path suggests that determining an approach's success is a contestable issue. As this research used questionnaires (gathering however the required data with significant accuracy) and in-depth interviews (tape recorded for accuracy and providing a summary to the interviewees as appropriate during the interview) there are some inherent weaknesses which must be recognized as no sample can ever be said to be completely random, since only people who are interested in the subject will answer it (Logothetis, 1992).

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Acknowledging the importance of each employee's or associate's role in a construction firm and considering that this research drew the conclusions based on data collected mainly by firms' owners and managers, it would be interesting if future studies could include more than one response from each firm in order to secure that the perceptions of more than one group of interest is recorded. This way not only the findings would be enriched but also the researchers would have a better understanding of the CSFs for the creation of a construction cluster.
Another important recommendation for future work is that since this research was conducted during a time of crisis not only for the context country but also for the construction sector, the derived CSFs and their rank may alter if the country's economy improves. Therefore another research over a period of time is possible to record new data and thus future studies should consider adopting a longitudinal approach.
Furthermore as this study was focused on a specific national setting, Greece, it would be interesting to investigate the CSFs for cluster creation within construction firms in other advancing countries. Further empirical studies could provide the basis for perceptive cross country comparisons with the purpose to identify potential similarities or differences, and to illustrate the role of different cultural environments in more diverse geographical settings.

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