A New Approach to Public Contracting of Sustainable Construction Using Innovation Partnership

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Abstract

Sustainable public procurement of construction projects is a key objective to fulfill the targets of the EU Green Deal, the new Regulation approved by the European Parliament, and the conditions required by the Facility of Recovery and Resilience approved by EU.

However, most of the adopted procedures are based on traditional procedures, open competition, or restricted procedures, which are not appropriate for developing an innovative approach aiming for more ambitious sustainable objectives.

Innovation partnership is a new procedure introduced by the EU Directives of Public Procurement of 2014 (Article 31º of 2014/24/UE), and it has been discussed and applied to the development of new products but, unfortunately, its potential has not been studied as a tool to prepare and to award more innovative and sustainable contracts of public works. This is the objective of the research presented in this paper, and a set of guidelines is deduced and discussed to support public contracting authorities to make better use of innovation partnerships.

Keywords: Innovation, Sustainable Public Procurement, Innovation Partnership

1. Innovation in Public Procurement

The importance of innovation to promote sustainable development has been supported by most economists as it is mentioned (Mazzucato, 2018) and public procurement should be considered a key instrument to improve and disseminate innovation policies as it is expressed by Recital (47) of the Directive 2014/24/UE:

(47) Research and innovation, including eco-innovation and social innovation, are among the main drivers of future growth and have been put at the center of the Europe 2020 strategy for smart, sustainable, and inclusive growth. Public authorities should make the best strategic use of public procurement to spur innovation. Buying innovative products, works, and services plays a key role in improving the efficiency and quality of public services while addressing major societal challenges. It contributes to achieving the best value for public money as well as wider economic, environmental and societal benefits in terms of generating new ideas, translating them into innovative products and services and thus promoting sustainable economic growth.

This approach stems from the preparatory 2011 Commission's "Green Paper on Modernisation of EU Public Procurement Policy" mentioning that the new Directives should "… *allow procurers to make better use of public procurement in support of common societal goals: These include protection of the environment, higher resource and energy efficiency and*

combating climate change, promoting innovation and social inclusion, and ensuring the best possible conditions for the provision of high-quality public services".

The quoted Directive is clear about the importance of innovation in public procurement (in Recital 95):

"In this context, it should be recalled that public procurement is crucial to driving innovation, which is of great importance for future growth in Europe."

And in Article 2-(22) innovation is defined:

'innovation' means the implementation of a new or significantly improved product, service, or process, including but not limited to production, building or construction processes, a new marketing method, or a new organizational method in business practices, workplace organization or external relations inter alia with the purpose of helping to solve societal challenges or to support the Europe 2020 strategy for smart, sustainable and inclusive growth "

However, innovation can be hindered by public procurement if the bidder has no degree of freedom to propose a different solution explaining why the Directive is in favour of variants as mentioned by Recital (48):

(48) *Because of the importance of innovation, contracting authorities should be encouraged to allow variants as often as possible*.

Furthermore, the quoted Directive also recommends the adoption of the Most Economically Advantageous Tender (MEAT) instead of the traditional Minimal Price Criterion (MP) as the award criterion in order that the full range of benefits of innovation will be evaluated and considered to make the award decision (Article 67). Such criteria are listed and cover quite a wide range of attributes such as:

"… qualitative, environmental and/or social aspects, linked to the subject-matter of the public contract in question. Such criteria may comprise, for instance:

(a) quality, including technical merit, aesthetic and functional characteristics, accessibility, design for all users, social, environmental and innovative characteristics and trading and its conditions;

(b) organisation, qualification and experience of staff assigned to performing the contract, where the quality of the staff assigned can have a significant impact on the level of performance of the contract; or

(c) after-sales service and technical assistance, delivery conditions such as delivery date, delivery process and delivery period or period of completion."

The recent European Green Deal approved in 2020 (https://www.ihobe.eus/news/the-european-green-deal-a-roadmap-to-a-sustainable-economy) aiming to achieve the first climate-neutral continent is based on multisectoral innovation to promote circular and non-carbon economies and therefore public procurement will be an important instrument to drive such challenging processes of societal change.

The European Commission supports the application of sustainability criteria and requirements in public procurement through several publications such as the well-known Manual on Green Public Procurement (European Commission, 2016).

2. Innovation In Public Works: Research Questions

Public works account for a substantial budget within public procurement of more than €500,000 M in 2017 (European Commission, 2019) and the sector of construction has quite a high impact on economic development as it generates more than 15% of GDP in many countries (Barlow, 2000) and more than 13 Million jobs (2021) in European Union (https://www.statista.com/statistics/763219/total-employed-persons-in-building-construction-industry-eu/).

Public works are also quite critical to implementing the Green Deal because changing the built environment is necessary for minimizing the consumption of non-renewable energy, promoting the circular economy, preserving natural resources, and avoiding transportation systems based on fossil fuels. The new technologies, more ambitious standards, and performance requirements are factors of the increasing complexity of public works explaining why innovation is also becoming more important.

The issue of innovation has been extensively discussed for public works but, unfortunately, the assessment of innovation in public procurement of construction has been quite disappointing despite the increasing complexity (Brown et al, 2015) of most public works as it is shown by several authors, such as (Barlow, 2000) mentioning that" *Concern about the poor performance of the construction industry, and its lack of innovation, is coming at a time when its customers are demanding more and projects are becoming increasingly complex*" or " *There is a perception that the industry (construction) is not generally innovative* " although "*The higher levels of innovation in the construction industry, the greater the likelihood that it will increase its contribution to economic growth*" as it is pointed out by (Blay and Manley, 2004).

Furthermore, several authors have pointed out that a culture of "adversarial actors" and litigation prevails in public work rather than a cooperative mindset (Bresnen and Marshall, 1999) proposing a "*partnering approach*" that can stimulate innovation and improve performance results. This culture of partnership is quite important for public works because each contract corresponds to a singular case and so the whole production process tends to be "one of a kind" due to specific conditions, restrictions, and objectives. Also, professional organizations such as the American Institute of Architects have proposed guidelines to foster an innovative and cooperative culture in public works (AIA, 2007 in https://aiacontracts.com/).
However, the traditional process of public contracting (Tavares, 2019), based on open or restricted competition is not much in favour of cooperation because bidding is a single stage non-cooperative, zero-sum game and the awarded contract just can be changed under very restricted conditions also defined by the quoted Directive under its Chapter IV "contract performance". Thus, the potential to implement a cooperative and innovative culture of new procedures such as the Innovation Partnership should be studied.

Therefore, the three research questions to be studied in the next paper are:

Research question 1: Can the lack of innovation in public works be explained by the adoption of the Minimal Price (MP) award criterion despite the increasing complexity and sustainability requirements?

Research question 2: Can Innovation Partnership (IP) be used to contribute to promoting a cooperative and innovative culture in public works?

Research question 3: How can Innovation Partnership (IP) be applied to the contracting of public works?

3. Can the Lack of Innovation Be Explained By MP?

Innovation in public procurement according to Directive 2014/24/EU and (Tavares,2019) implies two major conditions:

a) freedom to propose alternative solutions;
b) incentives to achieve better performance.

The process of contracting public works implies a multi-stage procedure starting with the initial document describing objectives, criteria, and restrictions often called the " Basic Program" followed by three stages of design: schematic design, design and construction design according to the US terminology (see https://www.asd-usa.com/blog/architectural-design-phases/) or "*program base, esquisse, Avant-project and project execution*" according to the French terminology. In other countries such as Portugal (Portaria 701-H /2008 , 28 July) the first stage corresponds to the "*programa preliminar* " (preliminary program) presented by the client and the second stage is the "*programa base*"(basic program) proposed by the designer, and then the following stages are " *estudo prévio*" (previous study), " *ante-projeto ou projeto base* "(design), and finally, " *projeto de execução*" (execution project).

The degree of freedom to innovation is quite high for the initial stages, but the bidder has virtually no room for innovation if the bid should be confined to the implementation of the construction design.

There are several approaches to the contracting of public works, namely:

a) the Design-Bid-Build (DBB), with two successive competitive stages, the former to award the design contract and the latter to award the construction contract based on a construction contract.
b) The Design-Build (DB), with just one competitive stage to award a contract including design and construction.

In the US DB is becoming quite popular as it is quicker and saves problems for the clients as they just have to interact with one contractor but this is not the case in Europe where professional architects associations tend to be in favour of DBB because they feel less dependent on builders. However, countries such as Italy and Portugal are approving special articles to facilitate the adoption of DB to contract public works supported by European Funds, namely those allocated by the Facility for Recovery and Resilience (Regulation of The European Parliament and of the Council 2021/241 of 12 February).

Thus, innovation may not be significant if DBB is adopted and if the minimal price is adopted because the single domain to innovate concerns the execution methods to be adopted and because there are no incentives but price bidding.

The TED website is used to find how often the minimal price criterion is adopted and for the active notices on 9 April 2023, the following numbers of notices were obtained:

	Open procedure	Restricted Procedure
Award criteria		
MP	971	14
MEAT	761	39

Therefore, most open procedures still adopt MP, which is not the case for restricted procedures.

These results show that the adoption of MP is a partial answer to the first research question, but other factors should be added to explain the low level of innovation, namely concerning the absence of incentives and the lack of freedom to propose alternative solutions and variants.

4. Can Innovation Partnership Be Used To Promote A Cooperative And Innovative Culture In Public Works?

4.1 What is Cooperation?

As it was mentioned before, the paradigm of *partnering* and cooperating is proposed as a key condition to develop innovation, but this implies having an accurate definition of cooperation, unfortunately, absent in legal articles about this theme. Actually, the scientific treatment of this concept has been developed in Economics, and Applied Mathematics due to the pioneering work by Von Neumann (1928) and (1944), as well as, later on, by Shapley (1958).

The traditional approach to contracting public works including full specification of requirements and of the construction design and adopting the minimal price as the award criterion corresponds to the case of a zero-sum game where the single outcome of the game is the price that is paid by the contracting authority and received by the contractor. Unfortunately, reality shows that such a game is an illusion because one of the objectives of the contractor is being compensated by unforeseen additional works accounting on average more than 25% as is shown by several studies such as (Tavares, 2017). Therefore, this means that the initial game is a zero-sum game but then, after starting the execution, the relationship can be modelled by the so-called incomplete contract (Hart, 1998, Wang, 2016 ,Hart and Moore, 2017) giving to the contractor "residual rights" which corresponds to a very unfavourable situation to the contracting authority (Martimore et al, 2005)because the options are just two: either accepting the new demands from the contractor or having a disruptive interruption of the execution implying high transaction and delay costs as well as risks of litigation. This unfavourable balance is aggravated by the information asymmetry between the contracting authority and the contractor as it is explained by the Principal-Agent theory giving additional advantages to the latter (Grossman, 1983, Salanié,1997, Maskin and Tirole, 1999).

On the contrary, cooperative games studied since 1928 (Von Neumann,1928, Von Neumann and O Morgenstern, 1944) are games avoiding the zero-sum balance and allowing the improvement of the outcome of a player without reducing the outcome of the other player. This means that for 2 or more players there is more than one set of outcomes called coalitions, $S(n)= (S(1),\ldots, S(N))$ satisfying the cooperation condition: the sum of outcomes is higher than zero.. Then, there are two problems to be solved:

A) Which is the optimal coalition maximizing the sum of the outcomes, $S^*(n)$, or at least a coalition better than the worst one, $S^o(n)$, and so near as possible to $S^*(n)$, and named by $S'(n)$?
B) How to share the value, $V(n)$, corresponding to $S'(n)$, by the players?

These questions were studied by several authors, namely (Shapley, 1953), the application of the concept of cooperation to the contracting of public works implies that the procedure will

be responsible for driving the decisions of both institutions to obtain a coalition S´(n) through an iterative and interactive process. Then, the coalition value, V(n), should be shared by both actors.

This means that such a procedure should include incentives to achieve S´(n) and a method to share V(n).

4.2 The Innovation Partnership

The need to develop a cooperative and partnering relationship between contracting authorities and contractors to promote innovation as it was presented before, it is fully understood by the new Directives explaining why the Innovation Partnership (IP) is proposed (Article 31º of the 2014/24/EU Directive) by the Recital (49):

"*Where a need for the development of an innovative product or service or innovative works and the subsequent purchase of the resulting supplies, services or works cannot be met by solutions already available on the market, contracting authorities should have access to a specific procurement procedure in respect of contracts falling within the scope of this Directive. This specific procedure should allow contracting authorities to establish a* ***long-term innovation partnership*** *for the development and subsequent purchase of a new, innovative product, service or works provided that such innovative product or service or innovative works can be delivered to agreed performance levels and costs, without the need for a separate procurement procedure for the purchase*" where the author underlined by bold the very challenging objective of " long-term innovation partnership.

This means that the single-stage bidding process of open or restricted procedures can be substituted by a partnering approach aiming at durable cooperation and reducing the losses due to the "residual rights". Thus, IP is not just a contracting procedure but rather a process to establish long-term cooperation.

The Innovation Partnership has three phases as it is studied by (Caranta and Gomes, 2021) concerning:

a) The selection of economic operators who will be partners of the procedure using as a major criterion their ability to promote innovation (Article 36º-c).
   Then a first contract is awarded to such operators so that the second stage can be started.
b) The second phase is the contract execution aiming to develop innovative solutions. According to Article 31º-2, it should include sequential stages and intermediate targets to be achieved by the partners.
c) The third phase also belongs to the contract execution and concerns acquiring the developed innovative solutions.

Obviously, the quoted Article specifies that MEAT criterion should be adopted in IP.

4.3 How Can Innovation Partnership Meet the Cooperation Conditions?

The presented description allows checking how IP meets the cooperation conditions:

a) Is there an Interactive and iterative sequence to improve S(n) by obtaining S´(n)?
b) Is there a procedure to share V (n) between the contracting authority and the contractor?

Fortunately, there is a positive answer to the first question because IP includes a sequence of stages allowing direct and iterative interaction between each competitor and pushing each

contractor to achieve higher targets set up the authority for each stage. Thus, the incentives stem from such targets and also from the competition between contractors which means that IP with just one contractor should be avoided.

However, competition is hindered if just one partner is qualified and contracted and so the possibility stated by Article 31-1:

"*The contracting authority may decide to set up the innovation partnership with one partner or with several partners conducting separate research and development activities"* should be avoided.

The answer to the second question depends on the adopted award MEAT criterion which is a function of a measure of the attained benefits for the contracting authority and of the contract reward allocated to the winning contractor. Therefore, a positive answer implies allocating a significant reward to the winner, namely:

a) Price of the contract
b) Respect for property rights including the transfer of their use but avoiding a transfer of property and
c) Allowing the contractor to make future use of the developed innovation.

On the other side, additional benefits can be allocated to the contracting authority, namely allowing future competition based on the developed innovation. An interesting example corresponds to the development of more advanced energy boxes to measure the energy consumption of each household as the electric utility (E-Redes, www.EREDES.pt) prefers to pay more to the winner and keep the rights of using the developed prototype to be produced by multiple producers-.Actually, another example of this situation is given in the next section by the contract awarded by CLUID in Ireland aiming to develop a methodology to be spread across the industry.

Thus, the answer to the second research question is positive if a very balanced equilibrium between the benefits and rewards allocated to both sides of the contract is fulfilled by the award criterion.

c) How Can IP Be Applied to the Contracting of Public Works?

Several types of application of IP to the contracting of public works can be considered according to the previous results, namely:

a) Development of innovative designs
b) DB for projects requiring innovative solutions
c) Execution contracts using innovative construction processes
d) Transforming existing constructions to achieve new performance standards, namely on sustainability.

The number of contract notices concerning public works and published by TED using IP from 1January 2021 until 1 January 2023 is 10 and their contents can be synthesized:

COUNTRY	BUYER	ABSTRACT
		The client is seeking a partnership with a modular construction manufacturer to plan

LOUXEMBOURG	Centre Hospitalier du Luxembourg	and realize the extension of the existing 2-story building A degree of prefabrication of 80-90 % is expected.
ITALY	Ministry of Infrastructure	Design and execution of the works to achieve energy efficiency of the building of the Supreme Court of Cassation, located in Rome, Piazza Cavour
IRELAND	Cluid Housing Association	Clúid wants to partner with a suitably qualified Contractor/ The goal is to develop an appropriate methodology for measuring, recording, and reducing embodied carbon in the construction process. While Clúid's focus is on creating high-quality residential developments, it is envisaged that this methodology would be shared with the wider construction industry.
GERMANY	Vattenfall Atlantis 1 und Global Tech 2 Offshore Wind GmbH	Wind-power installation works are divided into 3 lots: Lot 1: Foundation Installation; Lot 2: Inter Array Cable Installation; Lot 3: WTG Installation Vessel
NETHERLANDS	Gemeente Amsterdam, Ingenieursbureau	The municipality, school boards, and market players will work together to create at least 9 high-quality sustainable, circular, and flexible school buildings for Amsterdam over the next 10 years!
FRANCE	Territoire habitat (OPH)	The object of this contract is to create a building that is energy self-sufficient in all seasons, to be able to replicate it, and to make it accessible on the market: The technological strategy is based on storing the surplus of photovoltaic energy produced out of the heating period in the form of hydrogen and being able to reuse it via a fuel cell
SPAIN	Metro de Madrid	Modernization and implementation of a new system of lifts and of sales points
FINLAND	VAV Asunnot Oy	The contract concerns a new building with a total of approximately 60 apartments using hemp concrete blocks and taking into account Scandinavian weather conditions. The aim of the project is to build a sustainable and low-carbon apartment building and the low-carbon target is around 10% lower than existing projects under construction (14.7-15 kg CO2e/m²/a over the whole life cycle).
GERMANY	National park service gGmbH, Multimar Wattform	Design and construction of a new building, aquariums, and an adventure exhibition, as well as animal enclosures and biotope design measures in outdoor areas achieving sustainability targets.
IRELAND	Galway City County	Fabrication, provision, and installation of designed parklet units at locations throughout the city, at a number of inland and exposed coastal locations.

		The units should just use marine-grade stainless steel, hardwood, stone, composite recycled boarding, and soft landscaping/planting for a minimum design lifespan of 20 years.

The presented cases show that some of them concern green and lean construction and that most of the contracts concern public works focusing on the design and building of new systems such as wind power units, residential units, or parklets as well as the rehabilitation of old constructions to cope with sustainable targets, such as energy and low-carbon levels. Another example from Ireland concerns the development of a methodology and instruments for measuring, recording, and reducing embodied carbon in the construction process.
Thus, the answer to the third research question is yes, and, in most cases, the contract concerns the development of integrated solutions and instruments coping with sustainable targets rather than focusing on partial activities such as planning, design, or construction.
However, the number of 10 for the whole European Union for 2 years is surprisingly small confirming that IP can be a powerful instrument but frequently ignored by contracting authorities.

5. Conclusions

A major strategic objective of the European Union concerns the promotion of innovative public procurement to achieve more ambitious sustainable targets but, unfortunately, there are scarce shreds of evidence of innovative procurement of public works. This is why three research questions were studied in this paper:
a) Research question 1: Can the lack of innovation in public works be explained by the adoption of the Minimal Price (MP) award criterion despite the increasing complexity and sustainability requirements?

b) Research question 2: Can Innovation Partnership (IP) be used to contribute to promoting a cooperative and innovative culture in public works?

c)Research question 3: How can Innovation Partnership (IP) be applied to the contracting of public works?

The study of TED notices just allows a partial positive answer to the first question. The study of the structure of the IP procedure using the contributions of the Theory of Games is positive providing that this procedure is applied fulfilling the conditions required by the cooperative games.
Finally, the most significant cases of the application of IP to the contracting of public works are studied using again TED notices and showing that a wide diversity of challenges can be tackled by IP such as the construction of new sustainable low-carbon buildings, the rehabilitation of historical premises, the development of new management information systems to monitor the carbon incorporation during the construction, the renewal of complex equipment of Metro facilities, the production and installation of metering units and the development of wind power generation units.
Unfortunately, the small number of TED notices concerning the use of IP in the procurement of public works is rather small confirming the lack of training and skills of the public procurers to promote innovative public procurement.

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