POLITECNICO DI MILANO

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Corso di Laurea Magistrale di Ingegneria Gestionale

The link between centralization, digitalization, formalization and performance of public procurement: evidence from Italian Universities

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A.Y. 2016 -2017

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0 Abstract

Today a theme that is attracting the attention of the literature is that of public procurement, due to the increasing need of the government to reduce costs and the tax burden and improve the quality of the buying process. For this reason, the state seeks to put in place a series of measures, required by law in order to achieve the goal of increasing efficiency and effectiveness of the process.

Our research, focuses on the procurement process within the Italian public universities, it therefore has the objective of understand the characteristics of the procurement process of the Italian universities. The second objective of the job is to define how to measures the performances of the process, and understand the impact of the various organizational and technological configurations applied in the university context on the performance of the process.

A first part of the work consists in the analysis of the literature on the public procurement system and organization and the purchasing process within universities. A second part of the text defines the objectives of the research and describes the work carried out concerning the Good Practice project, and the analyzes carried out to try to answer the research questions, and understand whether the results are in agreement with what has been seen in the topic literature. Regarding the first objective of the work, we have concluded that the organization of the procurement process within universities, is influenced by contextual factors. Indeed, the procurement process within universities with small size, low complexity and high volume of supply per student is highly centralized and vice versa. The analysis shows that the Italian universities have a good level of usage of IT solutions regarding their purchases, and a quite structured procurement process.

With regard to our second goal, the performance of the universities procurement process is measured through the efficiency and effectiveness of the process. Centralization of the process has a positive impact on the efficiency, while the hybrid structure allows to achieve better results in terms of effectiveness. Also a high structuring of the process improves the performances in terms of effectiveness, while digitalization improves it in terms of efficiency.

1 Introduction

Today, an issue that is increasingly taking more interest is that of the public procurement, due to continuous changes of the political, socio-economic and legislative context. Particularly public procurement is continuing to evolve both conceptually and organizationally. That evolution accelerated during the 1990s as governments at all levels came under increasing pressures to "do more with less." Indeed, all governmental entities of rich and poor countries are struggling in the face of unrelenting budget constraints; government downsizing; public demand for increase transparency in public procurement; and greater concerns about efficiency, fairness, and equity (Thai 2008).

One of the elements that mostly affects the field of public procurement, is the need of the governments of reorganization of public finance and reduce expenditure (Albano and Sparro 2010). The government has therefore, the need to reduce costs and the tax burden and improve the quality of the buying process. This need to rationalize public spending and thus improve the purchasing process in terms of efficiency and effectiveness, is extended to all public bodies and therefore also to universities. This work therefore, focuses on the purchasing process of the universities in the Italian context, an issue that is now of interest to some recent research. The work has the intent to understand how it is organized the purchasing process in Italian universities, a process with particular characteristics compared to other public administrations. It is a fragmented process characterized by a large number of low-value purchases made from many different vendors, and by a very fragmented environment due to the presence of a high number of structures (departments) and consequently this creates a trade-off between the need to create cost efficiency and the need to maintain a personalization of purchases (Agasisti and Cavazzana 2015). The second aim of the research is to determinate how the measures suggested by the literature to achieve the objectives set by the public procurement system, such as centralization, digitalization and formalization, affect the performance of the purchasing process in terms of both cost and quality of the procedures. It then tries to understand how universities can structure and organize their purchasing process in order to contribute to the achieving of the Italian state goal, and therefore to rationalize the public expenditure, and particularly the expenditure for supplies.

A first part of the work focuses on the analysis of the literature on the public procurement and the purchasing process within universities. A second part of the text describes in detail the objectives of

the work and the research questions that we try to give an answer at the end of the work. The following chapter defines the methodology by which the work was conducted, in particular defines the research framework and the techniques used in the various phases of work. The fifth chapter provides the framework, which will be used throughout our analysis of the data, and describes how we arrived to the research results.

In the following chapter, the discussion of the results, are reported the main results we have reached. As a final part of the text, we have the one of the conclusions, where we give an answer to our research questions, and we report the contribution of our work to the theme, eventual limitations and future developments.

2 Literature review

In this chapter, it is made an analysis of the literature on the public procurement theme. In the first part is given a definition of public procurement, the second part indeed describes the environment in which it operates and its organization. Following in the third part are described the various activities of the process according to the Van Weele's model. Then, is made an analysis of the centralization and digitalization of the process by analyzing the various advantages and disadvantages that may be encountered. The last part of the chapter focuses on the procurement process within the university context.

2.1 Public procurement definition

Public procurement refers to the process by which public authorities, such as government departments or local authorities, purchase work, goods or services from companies by entering into a legal agreement. Examples include the building of a state school, purchasing furniture for a public prosecutor's office and contracting cleaning services for a public university. The public procurement is becoming increasingly important since the 90's, this for the fact that Governments, both in poor and rich countries have more and more need to produce more at the least cost (Thai 2008). They are therefore bound by budget constraints, and public demand for increased transparency in public procurement; and greater concerns about efficiency, fairness, and equity. Indeed, every year over 250. 000 public authorities in the EU spend around 17% of GDP on the purchase of services, works and supplies, and in the developed countries the incidence of public procurement on public expenditure is about 45 % (Brammer and Walker 2007). In many sectors such as energy, transport, waste management, social protection and the provision of health or education services, public authorities are the principal buyers.

In addition, the public procurement is attracting more and more attention, due to the continuous change of the surrounding environment, because of rapidly emerging technologies, increasing product choice, environment concerns, and the complexities of international and regional trading agreements. In this environment, public procurement has become much more complex than ever before.

2.2 Public procurement system

This section describes the environment in which the public procurement system operates, the organization of the public procurement process and is described in over the process in its various stages.

2.2.1 The Environment of public procurement system

The characteristics of a public procurement system depends on the surrounding environment meant as political, economic and social. Thai (2008) believes that the environment in which it operates a public procurement system can be described using the following parameters.

Governmental framework: Organizationally, public procurement depends on the government system, there are two types of systems, unitary and federal. In a unitary system, the central government exerts great control over local governments, therefore the structure and the process of public procurement are dictated by the central government. Instead, in a federal system, local governments enjoy greater autonomy, thus local governments define the public procurement process and structure, and there is therefore a great fragmentation in the public procurement system.

Market conditions*:* Economic or market conditions have a great influence over the public procurement system's effort to maximize competition. Moreover, the market determines whether or not socioeconomic objectives of procurement are accomplished; whether or not a governmental entity can fulfil its needs; the timeliness of fulfilment; and the quality and costs of purchased goods, services, and capital assets.

Legal environment*:* the public procurement is certainly influenced by the legal environment, which refers to a broad legal framework that governs all business activities, such as manufacturing, finance, and contract law.

***Political environment**:* In a democracy, many individuals, who have different interests and objectives, are involved in the public procurement system. Normally, a government program that is eventually adopted is a compromise among different views of interest groups, policy makers, and management. In this democratic environment, there are cases of a strong coalition of policy makers, bureaucrats, and interest groups in their effort to get their programs adopted. Public procurement professionals often have difficult choices as they face various political pressures and have to make successful economic decisions as well.

***International Trade Agreement**:* According to Becq (2006), markets become more and more globalized through regional and international trade agreements and treaties. One of the most relevant is the Vienna Convention on the International Sale of Goods which, applies to parties having their place of business in two member countries. Also the World Trade Organization's codes system includes other agreements which are relevant to procurement such as those on, rules of origin, and technical barriers to trade. Consequently, the public procurement system become more complicated, and have to face additional difficulties like communication, currency exchange rates and payment, customs regulations, lead time, transportation, foreign government regulations, trade agreements, and transportation.

2.2.2 Public procurement organization

This section describes the public procurement organizational structure and the various laws that regulate the system and therefore also determine the objectives of the public procurement system.

2.2.2.1 Organizational structure

Public procurement organizational structure depends on the government framework, unitary governments tend to use centralized structures, federal ones tend to decentralized structures, according to Choi and Hong (2002), there are three types of structures:

Centralized structure: A central procurement officer manages all of the rights, powers, duties, and authority relating to public procurement. The central authority may delegate some of his powers to other, always respecting a legal framework.

Decentralized structure: Decentralization occurs when procurement personnel from other functional areas can decide unilaterally on sources of supply or negotiate with suppliers directly (Dobler and Burt 1996).

Hybrid structure: it is a mix between centralized and decentralized structure.

CAPS (Center for Advanced Purchasing Studies) conducted a benchmarking analysis on a sample of forty state government organizations, from the research emerged that 57.5% of the organizations have adopted centralized organizational forms, while the remaining 37.5% adopted a hybrid structure (Center for Advanced Purchasing Studies 1999). As Shown by the analysis, the majority of the organizations have a centralized structure, but recently there is a tendency to decentralize, to improve responsiveness, eliminate bureaucratic obstacles, improve interdepartmental coordination, and empower manager's delivery service (Thai 2001). This need to decentralize some activities within the organization led to the propensity to adopt hybrid structures, in both the public and the private sectors, because this allows enjoying the advantages of both centralization and decentralization. Many researches in the recent years tried to make a comparison of purchases in the public and private sector. In general, a company purchases in order to produce goods and services and afterwards sell its products for a profit, their decision is mainly based on two criteria: price and quality. A public agency is a non-profit organization, which procures in order to produce and deliver services to citizens, companies and fellow agencies and is in most cases financed by taxes.

Nevertheless, numerous studies, have been conducted to highlight similarities and differences between public and private sectors in the field of procurement. Harland et al. (2000), identified in his studies some differences between public and private: the nature of the interorganizational network; the nature of the public service being provided; factors relating the recipients of the service; the nature of the supply market; the extent of availability of private sector alternatives; the nature of accountability; regulation, government, and investment cycles and influential government themes.

For example, Osborne and Plastrik say that public procurement is characterized by high levels of public disclosure and a heavy reliance on the bid process compared to private sector organizations (Osborne and Plastrik 1997).

Researchers have also identified certain similarities between the public and private sector, the Center for Advanced Purchasing Studies (CAPS), identified a common trend in both sectors to use automated systems for the management of transactions, and a propensity to adopt multi-year contracts.

2.2.2.2 Jurisdiction and objectives

Public procurement can be considered as a special case of business transactions between organizations. It is based on a different and stricter jurisdiction than transactions between private companies. Just as in the private sector, the public sector strives to get the best possible deal.

The private purchase process is not restricted by many laws that regulate it, in contrast to this, the public procurement process is in almost all situations and countries regulated by a specific legislation that is stricter than for the private sector's purchasing due to the fact that the objectives to which the public procurement must submit, in contrast to the private world, are made effective through the creation of rules, laws and procedures included in the codes of national public contracts (McKevitt et al. 2014). For members of the European Union, it is mandatory to implement the EC procurement directives (European Commission 2004).

According to (Thai 2008) the main principles of it, that carry over to the procurement directives aim to:

1. Increase transparency of procurement procedures and practices throughout the community.

2. Allow the free movement of goods, services, capital and people between member states.

3. Develop effective competition for public contracts.

4. Standardize specifications.

5. Provide advance information of procurement needs to the marketplace.

The European directives also imply that all public procurements in the European Union (EU) have to follow the following principles:

- ***Non-discrimination***: all discrimination based on nationality or by giving preferences to local companies is prohibited, non-discrimination requires that the staff of the purchasing function must be objective and alien to any kind of liking or preference, whenever he has to take a decision in respect of its suppliers (Vagstad 1995)

- ***Equal treatment****:* all suppliers involved in a procurement procedure must be treated equally, Specifically, equity means ensuring equal opportunities to all organizations that may potentially be interested in participating in a selection (Walker and Brammer 2007).

-***Transparency****: the* procurement process, must be characterized by predictability and openness. Transparency has become perhaps the goal on which the government will try to focus more. Public organizations as funded by the money of the citizens, it is required that all their procedures are available to the public and accessible by anyone (Erridge 2007).

- ***Mutual recognition***: the documents and certificates issued by the appropriate authority in a member state must be accepted in the other member states (Thai 2008).

2.3 Public procurement purchasing process

In this paragraph we will describe the public procurement purchasing process and the stakeholders of the process.

2.3.1 The purchasing Process

Now we will describe the purchasing process in public sector organizations according to (Van Weele 2005): The objective is to explore the main activities carried out through the procurement process. Inspite of the distinction between the public and private sectors, the purchasing process is still similar in that there are a set of core and common phases that organizations go through. However, the decision-making process is different in terms of the outcomes or factors that are taken into consideration, although the activities performed are similar. In literature, there are a number of models by various authors, we will now describe Van Weele's approach, which specifies six distinct activities (fig 1).

1. Defining specifications
2. Supplier selection
3. Contracting
4. Ordering
5. Expediting and evaluation
6. Follow up and evaluation

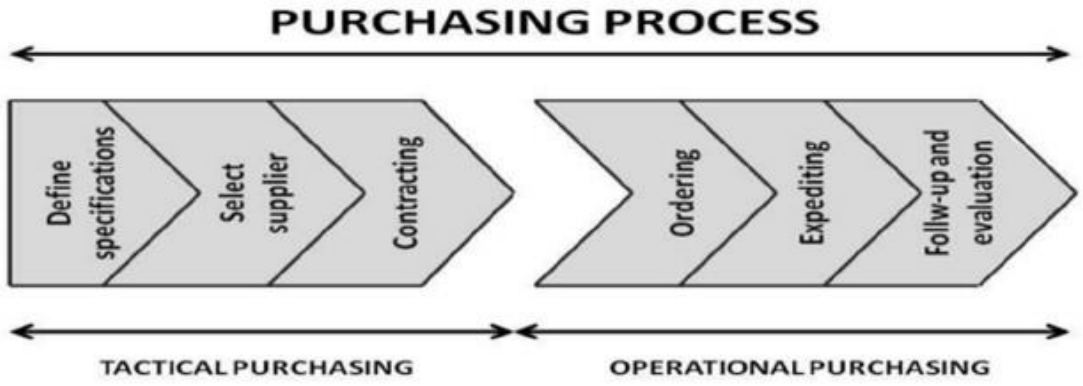


Figure 1 Van Weele, 2010: Purchasing process

Now we will describe every stage of the process:

1. **First activity: Defining specifications**

As for the private process even the public procurement process, starts from the need for a good or service by the organizational structures. This requirement may be partially programmed through instruments aimed at collecting needs such as questionnaires. During the specifications phase, procurement describes technical properties and characteristics of the product or service required, what does a product or service have to do, including any constraints. Determining the specifications is an important phase in the procurement process, as it will be harder to justify the awarding of a contract when it is difficult to write the specifications. In fact, in the situation of repurchasing an asset is easy to define the specifications, however in the case of innovative products becomes more difficult to define the specifications. Thai (2007) has defined the various types of specifications, in particular has distinguished the product specifications in *detailed specifications* and *other purchase specifications.* Instead he classified the service specifications in *Statement of Work, Performance Work Statement* and *Statement of Objectives.* Are described below the various types of specifications, given by the author in detail.

Types of specifications

As said before, Thai has classified the specifications in good specifications and service specifications.

- **Product Specifications**

Detailed specifications:

Material and Method of Manufacture Specifications: This type of specification is used primarily by the armed forces and by the Department of Energy. Potential suppliers are told precisely what materials to use and how they are to be processed.

Engineering Drawings: Descriptions by drawings, normally they accompany other purchase descriptions. It is an expensive method both from the point of view of preparing the information and

from using it in the manufacturing process. It is usually used to describe machine's parts or construction, and for all goods which requires high degree of manufacturing and precision.

Design Specifications: Design specifications establish precise measurements, tolerances, materials in process and finished product tests, quality control, inspection requirements, and other specific details of the deliverable.

Other purchase descriptions:

Brand Name Specifications: Brand name specifications identify, by name, model number, or other characteristics, a specific product manufactured by a specific corporation.

Brand Name or Equivalent Specifications: according to this all the models of different brands with equivalent specifications are taken into consideration by the purchaser.

Samples: Samples are often utilized when acquiring uniforms, badges, decals, footwear, bulletproof vests, and other items of this nature. For example, it would be quite appropriate to use samples when specifying that a precise shade of color is to be used as the color of the needed product. The alternative would be to attempt to describe, in words, the required color.

Combination: Many of the more complex products cannot be adequately described by a single type of specification. So it is needed to combine two or more types of specifications.

Performance Specifications: They are also known as functional specifications, with this method instead of describing an item in terms of its design characteristics, a purchaser describes what the item is expected to do. With this approach to procurement, the supplier is not directed to act in a certain way but rather is given an opportunity to use ingenuity and to innovate to provide.

- **Service Specifications:**

***Statement of Work* (*SOW*)**: A SOW describes the contract work to be performed and incorporates any applicable specifications. The scope and elements of a SOW greatly depend on what is being procured.

***Performance Work Statement* (*PWS*):** This one defines the specific performance required of the contractor, including standards to be met and a surveillance plan for the government to use in monitoring the work.

***Statement of Objectives* (*SOO*)**: A SOO is a high-level description of the outcomes desired by the government. The contractor reads the SOO in the solicitation document and prepares a proposal that outlines how it will provide a solution to the stated problem. This technique requires less work up front, but it also demands clear knowledge of the results needed and allows great flexibility to the contractor in performing the work.

2. Second activity: Selecting suppliers

After having determined their need, public sector organizations enter the supplier selection phase.

The main activities of this phase are scanning the market of suppliers, and the selection of the supplier that best meets the needs of the purchaser. Frequently the two stages of selection of suppliers and specifications, are carried out simultaneously or overlap, due to the supplier's involvement in the process through requests for cost estimates or technical specifications of the goods.

According to (Thai 2008) the selection criteria of suppliers, can be divided into “order-qualifying criteria” the minimum requirements needed to be met for consideration and “order-winning criteria” other criteria based on which the deal can be won. Supplier selection is influenced by the stage of specification, by political objectives and socio-economic objectives. A leading example can be found in South Africa, where, public procurement is being used to support a supplier selection process, that enables a specific sector of the supply according to the economically disadvantaged black majority both compete for and win public contracts.

In certain situations, many documentations are required for the suppliers' selection phase, obviously this disadvantage smaller suppliers who have limited economic resources.

Another fact that may cause difficulties for the supplier is the European Union law relating to public procurement, this provides for procurement above a certain threshold, the obligation to publicize the contract on the Official Journal of the European Union (OJEU) before anywhere else. This also implies the involvement of foreign suppliers, so the competition is both local and international, that is for sure a disadvantage for local suppliers who have to face increased competition.

A third factor that can present a pressure to providers, are the free trade agreements between nations, these lead to some benefits like bringing new ideas or create pressure on local suppliers and then force them to innovate. But it has a disadvantage for small suppliers and local suppliers since only big suppliers can meet the demand, and there is always the risk of selecting foreign suppliers, thus increasing competition.

3. Third activity: Contracting

Now we will describe the phase of contracting, the contracting methods, debriefing and contract administration. According to (Thai 2008) the contract is an agreement under which two parties make reciprocal commitments in terms of their behaviour, a bilateral coordination arrangement. This activity consists of determining responsibility, preparing awards, signing the contract, notifying and debriefing losing firms, and dealing with possible irregularities such as mistakes and protests.

For what concerns the private sector in recent years there is a trend towards relationships based on trust and mutuality rather than contracts, however the public sector is still very tied to relationships based on contracts.

Even for the public procurement organizations, such as private, are faced with the choice of "make or buy", then choose between producing internally (make) and contact an external supplier (buy). In a study, in particular a survey to a group of managers, led by Brown and Potoski (2004), trying to figure out what are the costs that are incurred by the management in the two cases, relying on transaction costs and on some theories about the public sector network. The study concluded that the choice of make, provides for increased management costs, while the buy provides for increased monitoring costs. Also believe that the drafting of a contract for an intangible service is much more difficult than the one for a tangible service.

***Contracting methods*:**

Thai says that in public contracts it is becoming increasingly important the value for money. There are two ways of contracting, the first is to select the most advantageous choice economically, thus with lower price (price-based contracting); the second is to create contracts based on specifications and performance (contracting for outcomes). This last mode offers more flexibility to the supplier, so led him to innovate. In some countries (e.g., Belgium and Germany); comprehensive, formal procurement rules are seen as necessary and desirable to prevent abuses that could slip through more ambiguous criteria. However, such normative approaches to procurement activity make it more difficult to use qualitative criteria and functional performance descriptions (the basis of outcome contracting), so the success of this method depends on how public procurement is organized. In the Anglo-Saxon world it is believed that both modes allow you to achieve the goal of good value for money.

Finally, the contracting process can also be affected by the estimated value of the contract. In Germany, for example the value of a contract can determine that both federal and national legislations apply. Similarly, for the European Union, different thresholds for different categories of procurement (supplies, works, and services) affect the purchasing process and the types of contracts to be used (national, international, chosen contract duration to make the tender process worthwhile, etc.). In U.S. federal government procurement, a combination of different values and different purchases are used in a matrix that identifies solicitation provisions and contract clauses for specific types of purchases (Thai 2007).

***Debriefing*:**

Debriefing means informing unsuccessful offerors of the basis for the selection decision and contract award, as well as what was wrong with their proposals. Successful offerors may also request debriefings whenever award is based on competitive proposals. The goal is to provide offerors with information that will help them submit better proposals in the future.

Procurement professionals should only offer a debriefing upon request. An offeror may request a pre-award debriefing by submitting a written request for debriefing to the procurement professional after the receipt of the notice of exclusion from the competition. In like manner, an offeror may

request a post-award debriefing (within three days, according to FAR) after the date on which that offeror has received notification of contract award.

***Contract administration*:**

After a contract is awarded, the project manager or contract administrator issues a notice to proceed that sets the contract administration in motion. Public procurement professionals are responsible for ensuring that the parties have complied with all terms and conditions of the contract. They should therefore track receipt of the deliverable acceptance, performance of the service, or payment under the contract.

It is often useful to hold a post-award conference meeting attended by the personnel from both parties to the contract, to discuss contract performance expectations with the contract administration team. The contract administration team is usually composed of some or all of the following members:

- *Contracting officer* (procurement professional, manager/supervisor of purchasing) the role changes from being an advisor during the foundation stage of the statement of work, to a decision maker during the bid process, to coordinator and team player.
- *Contracting personnel* (procurement professionals)
- *Technical project* personnel/contract administrator (initiating department, end user)
- *Financial auditors* (serve as advisors)
- *Legal counsel* (serve as advisors)

4. Fourth activity: Ordering

Is the phase of ordering goods from the selected supplier, according to Thai (2008), this activity can create tensions between efficiency and policy. For example, at a local government level, local politicians may favour local businesses over nonlocal suppliers. Similarly, in the public healthcare sector and other sectors, professional preferences (e.g., in healthcare, physician choice is based on noneconomic grounds) That can mean the using of so-called "maverick" contracts, where suppliers are not validated by procurement procedures. Such maverick activity means the appearing of highly variable demand to suppliers, and procurement cannot take full advantage of economies of scale.

These two factors undermine reaching full potential efficiency, affecting the ability to fulfil other policy objectives such as sustainability.

5. **Fifth activity: Expediting and Supplier Evaluation**

The expediting activity consists of the physical delivery of the good. In the purchasing model of Van Weele's (2005) procurement process framework couples expediting with evaluating suppliers, demonstrating the strong link between performance and actual delivery. By combining expediting with supplier management and post contract award management, the framework by Van Weele takes a wider view. In this wider view of expediting, procurement's role is assessing the achievement of purchasing objectives.

According to Thai (2008) evaluating suppliers highlights the tension between fulfilling operational procurement requirements, for example, delivery, quality and price, and the more strategic requirements or policy dimensions. In fact, operational purchasing by nature is price focused, whereas the emerging role of public procurement in socioeconomic change is linked to value for money, which is often not compatible with lowest price and has broader objectives. So the concept of value for money, shifts the focus of the system from operating targets to the long-term strategic objectives. The greater is the complexity of the output required the more will be difficult to reconcile operational objectives, strategic and policy goals. Such tensions can only be resolved through transparent links between performance measurement, performance management, and wider system goals.

For the procurement project, there is usually an **evaluation team**. The evaluation team normally consists of professional staff within the government entity. Occasionally, an elected official or a representative from the community can be appointed to the committee, but it is important that the committee include a representative from the central procurement office and the user agency.

The evaluation team, should develop an **evaluation plan**, according to Thai (2008) the purpose of this plan is to clearly identify this elements:

- Evaluation criteria
- Their respective weighting factors
- Scoring grid against which these evaluation criteria will be evaluated
- Scoring method

- Contractor selection method that will be used to determine which response best meets the Requirement.

Evaluation criteria:

The development of evaluation criteria that will appear in a solicitation issued to the private sector, should take into consideration many factors, including the nature of the specific requirement, the ability of the user agency to define the requirement in a clear manner, and the organizational culture or environment of the user agency.

Rating factors are then assigned to the evaluation; the rating factors should reflect the relative importance of the evaluation criteria. The two most common ways of expressing the relative importance of evaluation criteria are by point scoring or using adjectival descriptions. The procurement professional should work with the client to determine which values or attributes are most important to the organization and to the requirement.

Criteria can be divided into two groups," technical", which includes technical, management and corporate background criteria. The other group is "price or cost", which includes financial details. Points and adjective are typically assigned to only technical, management and corporate background criteria, this are some examples of criteria:

- Understanding of the project scope and objectives
- Proposed risk management approach
- Demonstration of expertise
- Qualifications of management team
- Firm's experience with similar projects
- Quality assurance approach
- Reporting and documentation arrangements
- After sales warranty or service
- Proposed level of effort

6. Sixth activity: Procurement follow up and evaluation

At this stage of the process, Van Weel (2005), describes how officials and agents of the public procurement system, follow up and assess the activities with the objective of improving the process quality. This phase therefore has as its ultimate goal to evaluate the impact the procurement process has upon process improvement and learning.

Of course, today, given the pressures related to the reduction of costs within the public sector, it becomes more relevant the concept of reducing costs in the evaluation of the procurement system. This entails the risk that the system quality could be assessed only in economic terms, neglecting deeper and more relevant objectives to procurement.

One of those risks is that when “value for money” is perceived as a key objective, evaluations can run into conflicts with accounting and control systems, which tend to revolve around monetary value alone.

The performance measure that is carried out during the follow-up activities, not only evaluates the achievement of certain internal objectives in the system; but also tries to assess the impact of the procurement process on suppliers, it collaborates with. Indeed, is in the interest of the organization to achieve their goals, but also being an attractive customer for the supplier market is an important goal. Among the measures used to assess the quality of the public sector as a customer, is the demand management capabilities, so that this does not present continuous fluctuations. Another factor with which the supplier makes its assessment, is the index of ease of doing business with customers, it seems justified by the increasing engagement of public procurement with wider objectives than cost.

2.3.2 Stakeholders of the public procurement process

The main stakeholders in the process of public procurement are (Thai 2008):

- Politicians: their role is to take decisions and initiatives.
- Central government: They formulate visions and take overall responsibility for the whole country.
- Local government: They are responsible for the local authority, community or region.
- Public agency: Agency that has been assigned by the central government to procure and sign framework contracts for specific functions or equipment on behalf of other agencies.
- End-users/employees: End-users are employees that will use the specific function, service or equipment that is procured.
- Citizens and businesses: the agencies' customers.

2.4 Centralization in the public procurement process

One of the major public sector needs now is that of expenditure restraint. Therefore, reduce public spending and its tax burden (Albano and Sparro 2010). A challenge faced by public administration bodies in the purchasing process is the need to balance between efficiency and effectiveness targets. To achieve this goal, are carried out a series of actions in the way of the purchasing process organization. Interventions such as demand aggregation (centralization), the digitalization of the process, formalization and standardization of the process, these actions create process improvements, which could achieve benefits in terms of efficiency, effectiveness and transparency of procedures. In this section, we will focus on the intervention of the purchasing process centralization.

The centralization of purchasing process consists in aggregating demand and needs, thus creating unique purchase power plants for standardized goods (Thai 2008). This creates a considerable advantage especially for large organizations organized in more than a structure such as universities.

Centralization, can be understood in two levels, internal and external centralization.

2.4.1 Internal centralization

The internal centralization defines the division of responsibilities within the buying process. ***Centralized structure***: all purchases are managed by a central office, it occurs when all of the rights, powers, duties, and authority are vested in a central procurement officer (Thai 2008).

Decentralized structure: occurs when procurement personnel from other functional areas can decide unilaterally on sources of supply or negotiate with suppliers directly, so all purchases are handled by individual offices or sectors (Thai 2008).

Hybrid structure: many times purchases are not totally managed in a single mode; in this case, we have a hybrid structure in which the management of purchase is divided between the central office and individual offices and departments, according to the purchase size or economic class commodity (Glock and Broens 2013).

Advantages and disadvantages of centralization

Centralization of the public procurement process has had international success both in terms of reducing public expenditure costs, and reducing administrative costs for companies.

According to various authors of literature including Thai (2008), Albano and Russo (2009) the main advantages of centralization are:

- **Increase of the efficiency of the procedure and rationalization of the purchases**: With the aggregation of demand, and the high volumes, the supplier can exploit advantage of economies of scale and scope, and thus obtain from the supplier a lower price for the product.
- **Reduction of transaction costs**: The second argument refers to the set of transaction costs that, can be saved through a drastic reduction of identical procedures and decentralized information gathering, preparation of tenders, selection of operators, monitoring and ex-post verification.
- **Reduction of transaction costs for the supplier**: Reduce transaction costs, promotion and distribution costs incurred by companies when switching from numerous procedures dispersed over a vast territory to a very small number of centralized procedures.
- **Encouragement of innovation**: In providing for the needs of the PA, the centralization can bring on innovation of both product and process. The definition of minimum technology requirements aligned to the market technological frontier allows to introduce within the PA at least the standard level of the most widespread technological advances. Instead the indication of performance requirements stimulates the market to seek even more sophisticated solutions in order to achieve the desired results. The natural business investment risk would be, therefore, the more reduced the more accentuated is the centralization of the application.

According to literature, there are also a series of disadvantages:

- Lack of sensitivity to the unique priorities and operational realities of different user departments.
- Possible difficult procurement and project schedule coordination as the central procurement office has its own priorities and the project manager has tight project completion time table.
- The case of complex goods: For products or services characterized by a high rate of innovation and investment in R & D, the use of forms of auction for the public or private supply of this type of goods undergoes serious difficulties (Nicita and Pammolli 2003)

2.4.2 External Centralization

It defines the use of central purchasing bodies of third parties to make purchases of goods and services. The central purchasing bodies purchase centrally to achieve cost savings in terms of both, the unit price of the goods, thanks to large purchases, and in terms of reduction of the management costs of the procedure.

Public procurement organizational structure in many countries depend on the type of government, in some countries there may be a central procurement office for the whole nation, in other countries, with a federal government, public procurement structure id decentralized. In Italy, the law provides for many measures, ranging in centralize public procurement process, bodies of the public administration for most of their purchases must make use of the central purchasing body Consip.

Central purchasing bodies advantages and disadvantages:

According to literature **advantages** of central purchasing bodies are:

- **Benefits for human capital**: The centralization of the management of a large number of public contracts in a restricted set of central purchasing bodies could serve to catalyse the professional specialization in the public contracts sector. The interaction with a plurality of PA and shopping centers make it possible to refine evaluation techniques of heterogeneous needs between different administrations, as well as make available for a pool of experts all available information relating to the reference market dynamics, useful for the implementation of the strategic plan of the race.
- **Cost reduction**: The adoption of central purchasing bodies allows the reduction of product and service **price** thanks to the aggregation of demand, and thus the possibility of exploiting economies of scale and scope to reduce the unit costs for the supplier. At the same time, through the agreements, they are contained **transaction costs** for tenders and for the negotiations conducted through private procedures (Nicita e Pammolli 2003).
- **Respect for the principle of transparency**: The central purchasing bodies ensure compliance with the principles of transparency through the use of electronic instruments (Antonio Nicita and Pammolli 2003)
- **Simplification of procedures and reduction of time**: The central purchasing bodies allow the simplification of the purchase process as Consip is responsible for many phases of the purchase process, also the lead times are reduced significantly using a telematic system. (Broggi 2008).
- **Advantage for suppliers**: Suppliers may have access to the public market supplies, with a high sales potential, with the ability to become a supplier for many public authorities with a unique tender.

We also have a series of **disadvantages** for the central purchasing bodies*:*

- The main drawback in the system of central purchasing bodies such as Consip, is the penalization of smaller companies, because it creates barriers to entry, going against freedom of competition and increasing the risk of an oligopolistic market. Elements that create barriers to entry are:
  - They require high skills and technical knowledge to meet the requirements.
  - Italian companies have very low digital skills level; this implies the exclusion of a large number of companies from the competition.
  - The aggregation of demand excludes all small and medium enterprises from the competition, since they have limited production capacity.
  - Economies of scale and alleys as minimum sales volume required makes more competitive big companies and penalize those small.

- The aggregation of the purchases, causes the personalization of the service loss, as the applicant and the supplier does not have a direct relationship, it becomes difficult to assess the level of service.
- Another disadvantage for the government, is the uncertainty about the possibility to make purchases because conventions are not always available

2.5 Digitalization of public procurement process

In this section we are going to describe the new trend to digitalize the procurement process, are described the e-procurement systems, objectives, benefits and instruments.

2.5.1 E-procurement

To achieve the goal to rationalize spending within the public sector one of the measures taken is the digitalization of the process; this makes it possible to achieve significant advantages in terms of cost and time efficiency and process transparency (Ronchi et. al 2010).

In Italy were introduced a number of legal measures with the aim of digitalizing the procurement process within the public sector, in all its phases. And whereas before all electronic instruments flanked traditional instruments now, go to replace them with legislative obligation.

Article 44 of the new procurement code implies that within one year after the entry into force of the code, will be defined how to digitalize all public contracts.

Article 51 instead implies that all communications and exchanges of information must be carried out by electronic instruments.

Art. 40 contains the obligation to communicate by electronic instruments during the contract award procedures.

According to Vaidya (2008), e-procurement is an innovative element that has many benefits for organizations that use it, but its success could be hampered by two factors. First, the computerization of procurement procedures requires technological and organizational prerequisites that many organizations cannot guarantee, because of the lack of infrastructure and technological tools, and the lack of knowledge and ability of operators involved in the process. The second factor is that the risk of computerizing the inefficiencies in the case of organizations, which already lack the skills necessary for the management of the phases of the buying process.

Definition of e-procurement:

E-procurement refers to the use of technological tools that meet the organizational and legal constraints, in the support of a contracting authority in the computerized management of all phases of the procurement process of goods and services, which the organization needs for its operation.

Other definition is:

Public electronic procurement refers to the "use of the Internet-based Inter-Organizational Information System, which automates and integrates any part of the procurement process in order to improve the efficiency and quality in public procurement, and to promote transparency and accountability in the wider public sector" (Vaidya et al. 2008)

2.5.2 E-procurement objectives and critical success factors

In this paragraph, are described e-procurement objectives and critical success factors according to literature.

2.5.2.1 Objectives

According to research conducted by the Polytechnic of Milan in collaboration with Cineca, on a sample of Italian universities, the main objectives of the digitalization of the public purchasing process are the increase of the efficiency of the process in terms of cost and the quality of the process. In particular, it seeks from one part to reduce the costs of the process to achieve greater efficiency, from another to facilitate the procedures by streamlining the supply and demand and facilitating the monitoring of the process. It also aims to increase the quality of the buying process, increasing the value for money and improving supply conditions. It tries to improve the quality of the process also through a better management of the relationship with suppliers, so they try to improve the relationship with suppliers, make a more accurate assessment of suppliers and better manage the risk of strategic suppliers.

2.5.2.2 Critical success factors of e-procurement

From a literature survey of (Vaidya et al. 2008), eleven factors emerged as critical to the successful initiative of e-procurement implementations.

E-procurement includes new technologies and changes in traditional procurement approaches, the need to train staff in procurement practices and the use of e-procurement tools are critical to the success of an e-procurement initiative (WB 2003). The success of an e-procurement initiative in the public sector depends on users who use the system, it is therefore necessary to train users to assimilate technological skills needed to use the system, so the firs critical success factor is the **End-User Uptake and Training**. In addition, the training should ensure that they could reap the benefits related to the use of the system. The e-procurement system could be used for the buying process within the organization only if also suppliers adopt it. So the success of an adoption of an e-procurement system also depends on **the involvement of suppliers**. It is important to present the solution to suppliers and discuss their problems and concerns, and make known the benefits of the system even for the supplier to maintain a wide range of suppliers.

Another important factor for the success of e-procurement system **is the compliance with best practice for the business case.** E-procurement initiatives only deliver the planned benefits if the users and buyers make changes to the way they work, Birks et al. (2001) suggest that the business case processes for e-procurement should include identifying drivers, understanding the starting point, benefits, approaches, affordability, risks, and benefit realization. To ensure achievement of the e-procurement objectives, the implementation project should proceed, as far as possible, in alignment with the business case.

Also the **integration between the e-procurement system and the existing information system** is essential, in fact, with increasing integration complexity increases the need to adapt the various business processes to the new system. Besides being well integrated with the existing information system, Also It is critical to link the e-procurement system to the financial management system to facilitate the process of online payment to suppliers.

Because of the sensitivity of the government data and the legal nature of orders and payments, **security of data** is critical in E-procurement systems. The system must have mechanisms for identifying and authenticating the user who places an order so that the supplier knows it is safe to fulfil the order. Vaidya highlights the need for transactions between different systems to be exchanged in secure ways with absolute assurances regarding the identities of the buyers and

suppliers. To encourage buyers and suppliers to engage in E-procurement, it is critical that both parties have complete confidence and trust in the underlying security infrastructure.

The researchers suggest that the success of the e-procurement within an organization depends more on **the re-engineering of procurement processes** that by the implementation of the system itself. Indeed, e-procurement is introduced to achieve greater effectiveness and efficiency in terms of cost and time in the system. Where existing organizations in procurement practices and procedures may contradict the goals and objectives of the new initiative, the implementation of e-procurement will require the re-engineering of existing purchasing processes (KPMG 2001). Reengineering must go and touch all the elements that affect the system including the relationship with suppliers. According to literature another important element is the **performance measurement** and so defining key performance indicators (KPI) from the early stages of implementation of the system, because it allows management to measure organizational progress and benefits of the new system. After defining the KPI, the organization must make a continuous monitoring of their progress over time.

The role of top management is crucial in the implementation of the new system. Considerable attention and support have to be provided by senior management to ensure that the procurement reform has been well understood in the organization. In addition, the executive management team is responsible for defining the objectives, bringing about collective commitment for change in process and organizational structures, and formulating the policies and strategies necessary to put an e-procurement initiative in place. **Management have also to change its program** in order to speed the adoption of the e-procurement system within the organization. The Office of Government Commerce (OGC) suggests more attention should be paid to change management issues, citing three ways to achieve successful change management for e-procurement: consultation, communication, and issue resolution (OGC 2002). The World Bank report cautions that although change management may be the least expensive aspect of an e-procurement project, a lack of it can be a leading cause of project failure (WB 2003).

According to the research the creation of documented and executable **implementation strategies** prior to the deployment of the e- procurement solution is an important CSF. This notion is further supported by the OSD report (2001) findings that as the procurement strategy is intended to provide savings enabled by the technology, e- procurement should be procurement driven as well as technology driven.

According to the Vaidya et. al (2008), successful introduction and adoption of e-procurement in the public sector also depend on the ease with which procurement related data can be exchanged both within the agencies and between their supply bases, and so depends on **the communication standards.** It seems that there is agreement emerging on the adoption of extensible Markup Language (XML) as the basis for common standards.

2.5.3 Benefits of e- procurement

Even the field of public procurement as all sectors, tries to take advantage of benefits of the technology, according to the literature in fact e-procurement allows to **simplify and standardize the procurement processes** through the streamlining of the process due to the management of all procedures by electronic means and, consequently, reduce the time of procedures (Vaidya 2007). Thanks to the use of technologies, the digitization of the procedures **impulses innovation** through the spread of IT culture and technological tools such as digital signature. It also allows the availability of a great information **heritage on public procurement** and to **reduce the risk of error** due to the rationalization of the process. As said before digitalization and e-procurement systems increase the efficiency of the process, indeed according to Ronchi (2010), digital tools allow to increase the visibility of expenditure and therefore better control of costs and to identify waste and inefficiency, in this way to **reduce the cost of the purchasing process**. E-procurement systems allow to achieve some of the objectives of public procurement such as **transparency,** indeed digitalization allows to Increase the transparency of the process through tools that allow the traceability of the procedures and management supervision. Consequently, foster competition and reduce the risk of corruption. Another objective is the guarantee of freedom of competition and **equality of treatment** with such a faster and wider access for companies. The e-procurement systems cause a variety of effects, the first called **communication effect**, that is creating an efficient flow of information during the process. The second one is the **brokerage effect**, which is the improvement of the match between the needs of the buyer and the supplier's offer. The last one the **integration effect** it means the establishment of closer ties and greater cooperation between actors of the system.

2.5.4 E-procurement instruments

The e-procurement tools available today are (Marra 2006):

• **Electronic market and online catalogs**:

Online digital market, which supports public authorities in the buying process. Organizations can purchase goods and services with a value below the EU threshold through the system providers.

Enabling of the supplier and the publication of its catalog products, can be managed by the administration or directly from the manufacturer. Consulting the catalog products administrations can check the supply of goods, make a request for quotation, compare it with the offer of other suppliers and make the order online. This buying mode is suitable for most of small amounts purchases or purchases with very specific characteristics such as those of the universities.

• **Tenders and online auctions**:

Telematics tenders consist of the management of calls and tenders through the use of IT tools. The peculiarity of this type of tender is to use an online platform of e-procurement and digital communication tools such as digital signature and certified electronic mail. This makes the process more efficient, faster and safer than the traditional paper-based submission of the documentation.

• **List of suppliers**:

A web portal, which supports the contracting authority in the selection of the contractor, as it allows the verification of general and professional requirements suppliers. The Register allows suppliers to register by filling out an online form, and the presentation of the documentation, which proves that they meet the requirements digitally signed. Supplier at the time of registration may indicate one or more product categories for which it is available, once registered, the administration verifies the requirements declared by the supplier, and contact the supplier for any clarifications. The register vendors could be used for purchases of goods and services of value below the EU threshold.

- **Procure to pay systems**:

  Procure to pay means the whole process covering all activities from the purchase requisition to invoicing and payment to the provider. It is a burdensome procedure for the administration both in terms of time that of required skills and tools for the support of the purchasing process. Task of the procure to pay system is the automation of process activities (Purchase Requisition, issuance of the order, receiving the product, testing and connection to the invoice payment system). These provide advantages in terms of efficiency and cost control for better management and monitoring of the relationship with suppliers.

- **Consip and central purchasing bodies**:

  The need to reduce public spending has led many countries, including Italy, to centralize their purchases in the public sphere by making use of central purchasing bodies, using technological tools for the management of supply as conventions, framework agreements and electronic markets. The main advantage of the central purchasing body is the increase of the buyer's negotiating power, in addition to an improvement in value for money.

2.6 Purchasing process in the Italian universities

This section describes the characteristics of the procurement process of the Italian universities, it is reported, what is said in the literature on the adoption of measures such as centralization and e-procurement systems within the university context.

2.6.1 Purchases within the universities

According to research conducted on the purchase of 52 Italian universities, purchases of universities, are many purchases of low value, made through a variety of different vendors, in fact 95% of purchases were worth less than € 7,200 (Agasisti and Cavazzana 2015). According to research conducted by the Polytechnic of Milan in collaboration with Cineca, regarding the purchase process, a particular feature of the university is the presence of independent structures from an organizational point of view, the departments, this feature creates a series of effects on the purchasing process of universities, particularly the decentralization of the purchasing process described below.

- **Proliferation of suppliers**: the departments have recourse to a large number of suppliers for purchases of small amounts; in fact, the various departments turn to different suppliers to buy similar goods and services.
- **Disaggregation of demand**: different departments make repeated orders to the same supplier, this increases the process management costs.
- **Buying process**: each department buys with different modalities and instruments and this lengthens lead times.
- **Many structures that purchase**: the supplier relationship is managed by the individual department, in this way the suppliers are poorly monitored, and the university does not have enough knowledge of the market.

Classification of purchases

For improving the quality of the purchase process within universities, action must focus on individual process steps; the first intervention is to optimize the supply of goods, the research conducted by the Polytechnic of Milan and CINECA suggested to use the Kraljic model (1987) to identify best sourcing strategies for each type of purchased goods. The model classifies purchases based on two variables, the relevance of purchases for the functioning of the university and the complexity of the market, understood as the amount of providers available in the market.

	Low market complexity	**High market complexity**
Low relevance of the purchase	Non critical goods	Strategic goods
High relevance of the purchase	Leverage goods	Bottleneck

Table 1 Classification of goods according to Kraljic model (1987)

According to this model are identified four categories of products and the relative supply strategies:

Non-critical purchases: have a low impact on the functioning of the university and a low market complexity.

Leverage purchases: they have a big impact on the functioning of the university and a low market complexity.

For these two categories of purchases, the university should use its bargaining power due to the low complexity of the market and minimize costs and prices.

Bottlenecks: have a low impact on the functioning of the university but are not present in abundance on the market. For this category, the university should adopt a partnership approach with the supplier.

Strategic purchases: are goods necessary for the functioning of the university characterized by a high market complexity. For this category, it is advisable to establish stable relationships with the supplier and look for possible alternatives.

2.6.2 Centralization of the purchasing process within universities

Realizing an internal centralization is not easy, due to a lack of skills, at the level of organization of the purchasing office, which has administrative skills but does not have the specific skills required for the management of the procurement process. Another problem encountered is the lack of knowledge of the markets and of specific products.

According to Barbieri and Zanoni (2005), the latter is a typical problem of the universities, where a large part of purchases is linked to teaching and research, and are specific purchases. For this reason, Italian universities, always entrusted the strategic purchase to the professor or the project manager, since the office did not have the skills to do it, in fact, the risk in case of lack of skills, is the evaluation of the offer based on the economic convenience neglecting the qualitative assessment of the good. Then the purchasing department was limited to the management of the administrative part of the procedure. Because of all this, the centralization, in the case of purchases as those of the universities, had a trade-off between achieving the objective of efficiency and the satisfaction of the applicant. To solve it, sometimes are adopted hybrid structures for the procurement process of the universities, in which the purchasing of standard goods is centralized, and leaves the management of specific purchases to individual departments.

The figure of the buyer

In order to rationalize purchases and facilitate the adoption of e-procurement platforms within universities, researchers, consider suitable the introduction of the figure of the buyer. The buyer is a function, which is entrusted with the task of managing the purchasing process through a centralized structure of the process, or by holding a decentralized structure and entering a buyer for each structure of the university. The objectives of the buyer are:

- Aggregation of demand: the buyer analyses requests from the various structures and aggregates the demand for goods, for the whole university, in order to achieve savings in the purchasing process.

- Expenditure planning: The simplification of the purchasing process allows shifting the focus on more strategic activities for the purchasing process.

- Negotiation: the demand aggregation increases the purchase volumes, and buyers can get lower prices from suppliers and better supply conditions.

- Knowledge of the market: the buyers due to its function has a greater knowledge of the market, and thus can follow sourcing strategies that best meet the needs of the university.

- Interaction with central purchasing bodies: the buyer assumes the role of interface between organization and purchasing center.

- Management of the relationship with the supplier: the buyer is responsible to manage the relationship with the supplier and monitor it.

2.6.3 E- procurement within universities and its benefits

As with any government department for universities emerged the need to streamline costs. It then tries to implement e-procurement in their procurement system with the aim of simplifying procurement procedures, increase the efficiency of the process and to spread a culture of e-procurement. The University E-procurement project has constituted a vital step in the process of rationalization of the Italian government's expenditure on goods and services. The university sector expenditure can be classified into two main categories, the first category of costs in common with other public organizations, and a second category, which is only part of the universities. This second category in part is shared between all the universities and in part only concerns a group of universities. This classification is extremely useful when it comes to defining the e-procurement pattern for universities, because an appropriate intervention can be exploited for each category (Barbieri and Zanoni 2005).

For example, for shared expenditure such as various services, stationery, fuel, etc.., can be used the same electronic catalogues already used by the government sector: thus the point is to publicise these tools within the purchasing structures of universities, and to help people learn how to use them. Instead, for highly specific goods/services such as teaching equipment, classroom furniture and magazines could be purchased based on their degree of standardization through electronic catalogues, while the marketplace or auctions would be better suited to specific software, technical equipment or special machines, depending on the respective purchasing frequency and unit price.

For the implementation of an e-procurement system within universities, the organization must undertake a series of communication measures in order to improve people's awareness of e-procurement aims and opportunities, measures such as meetings and training courses. A second operation is that of a promotional action by the management of the universities to publicize the benefits of e-procurement.

The introduction of e-procurement systems as platforms, within universities for the management of the purchasing process should present some necessary features to create benefits of standardization and process traceability.

1. Supporting the entire purchasing process from the detection of the need to pay.
2. Traceability of the process: that is, the opportunity to follow the progress of the order in time.
3. Configurable Workflow: that is, the ability to define different approval paths, based on certain parameters such as product category, spending threshold etc...
4. Integration with other parts of the system: particularly the integration with the accounting system to control the coverage of the budget and the document management system.

2.5.3.1 Purchasing platforms of universities and the example of Cineca platform

Today the market offers many e-procurement platforms used by universities; this section examines a sample of these platforms, the one proposed by Cineca.

Cineca platform offers the following features:

1. Supplier management
2. Procurement
3. Contract Management
4. Purchasing procedure

Supplier management

The platform allows a supplier's information management. Suppliers can be registrated by the administration or register itself via the supplier portal, where they can create and update their own information, fill out questionnaires, view orders and view the status of receipt of goods or services provided.

Procurement

Vendors register: the platform is equipped with an engine of the vendor's register.

Market research: The Portal allows you to offer requests to one or more suppliers for a given set of products or services.

Contract management

Contract management: The platform has a module for the management of contracts, allowing the automatic production and management of documentation related to contracts. Facilitating the collaboration between the different actors involved in the process.

Catalog management: the platform offers a complete system for catalog management, allows the manufacturer to publish a catalog containing all data and images. Offers the possibility to browse through the various catalogues and compare the results to see which best meets the needs.

Purchasing procedure

Purchase Inquiry: the system allows to carry out two types of purchase requisitions. Basket request, for goods and services already in the catalog and free request for goods that are not present in the catalogue.

Order: Once the RFP, the user goes to the stage of creating the order it is possible to aggregate multiple requests in the same order, or divide a request into more orders.

Receipt and acceptance of goods and services: the system reports, the receipt of the order to the management system through an entry document of the goods.

Workflow management: The system includes a module for the definition and execution of the process workflow. This module notifies the users involved in the process, the need for their intervention, for activities that cannot be automated, such as the approval of a request.

3 Research Objectives

3.1 Introduction to the research questions

This research is concerned with a branch of the vast subject of the public procurement, an issue that is becoming increasingly important in recent times due to the continuous economic and environmental developments relating to the environment. In particular, it focuses on the topic of public procurement within the Italian universities.

Starting from the analysis of the literature in the second chapter have been identified the objectives and needs, which has set the status concerning public spending, which therefore spreads to all Italians public bodies involved in the procurement process and therefore also the universities. The main objectives that the public procurement now proposes at the economic level are the rationalization of expenditure, and therefore an increase in the efficiency and effectiveness of the process (Thai 2008). Recently in addition to the economic dimension it is assuming importance the social and environmental dimension. Now public authorities seek to take measures so as to reach both the economic objective, and targets of interest for the involved entities such as the transparency of procedures (Erridge 2007), and therefore the ability to cope as much as possible against corruption, equality between competitors and the involvement of the largest possible number of vendors trying to eliminate any barriers to entry, through actions such as the simplification of procedures for access to calls for tender (Walker and Brammer 2007).

The university context on which focuses our research is a particular case, the buying process in universities indeed presents particular characteristics because of the very fragmented university structure, and the complexity of purchases due to the fact that in many cases, the purchase has high specificity because it's shopping for teaching and research purposes, also it has high differentiation as different departments have different needs and areas of research (Agasisti and Cavazzana 2015).

Recently some studies are focusing on the purchasing process within the Italian university, as we saw in chapter two, the university buying process presents some difficulties in the organization of the process due to the characteristics of the university context and the type of purchases, therefore they require very specific expertise to manage them (Barbieri and Zanoni 2005). In our research so we try to study the subject that is taking the interest of some authors.

The research therefore, has the objective in the first part of describing the procurement process of the universities, and so to understand how the process is structured and how it is organized the procurement function within the various universities. It also tries to define the level of implementation of the various measures undertaken by the entire public sector in order to achieve its goal, in the university buying process and how they are applied. In particular, we intend the measures suggested by the literature, we have extensively explained and contextualized in the second chapter: The centralization of purchases, formalization and structuring of the process and the adoption of new technologies and e-procurement systems within universities. The second part of the work seeks to understand how to measure the performance of the purchasing process within Italian universities, and therefore how the measures adopted by Italian universities affect the performance of the purchasing process and so if they facilitate the procedures, reduce the cost of the process and create a satisfaction of the university.

3.2 Research questions

We define the following research questions:

1- Which are the characteristics of the procurement process of Italian universities, and how its management is affected by the level of centralization, digitalization and formalization?

2- How to measure procurement performance in Italian universities?

4 Research Methodology

This section describes the methodology used to do the work. In a first step, it describes how it was made the analysis of the literature, then it is explained how we defined the research objectives and questions. In the following paragraph we define the research framework, the model used to make all the analysis of the data and results. In the second part of the chapter we explain the ways in which we collected data on which it is based our analysis of the results, and how we obtained answers to our research questions.

4.1 Literature review

The analysis of the literature was performed using an internet search of academic articles concerning the themes of research with the aim to analyse the results obtained from the great authors and researchers in their analyses and case studies regarding issues of interest. It was also used the material received from the observatory project Good Practice to support the analysis. They were used 48 sources including 46 academic articles and two websites to consult some legislative parts.

The analysis of the literature focuses on the following topics:

a) Public procurement

Were read 26 articles and research papers about public procurement, to try to have a clearer view of the context in which the analysis will focus, trying to select articles and texts, as concerns regarding the European Union and in particular the Italian context. Five articles of them concerns the public procurement process. Almost all items considered for this part are part of the "International Handbook of Public Procurement ", "Journal of public procurement" and "Journal of Public Economics".

b) Centralization of public procurement process

It was carried out an analysis of a series of 7 articles concerning the centralization of the procurement process and its advantages and disadvantages in terms of process performance.

c) Digitalization of public procurement and e-procurement

We sought to define the term e-procurement trough the literature analysis. It was continuously made an analysis of 13 texts to understand what were the benefits of digitalization of the procurement process identified by researchers and e-procurement tools, then they were given the information, mentioned in several articles by multiple authors. A good part of articles concerning this part is part of the "International Handbook of Public Procurement "

d) Procurement process in the Universities

In the previous parts, we tried to bring a general framework, in this part was made an analysis of information about the supply of universities and application of centralization and e-procurement systems to their trial, comparing the data reported in various articles available. They have been taken into consideration the Italian universities that are the object of our work. In literature are still not present so many articles on this subject, they were used three articles, one of which is an academic paper and two reported research carried out by other authors.

The number of articles exceeds the total number because some articles were used as a source, for more parts.

4.2 Definition of the research objectives

After the analysis phase of the literature, were defined objectives of the research based on data derived from literary analysis. In particular, thanks to the literature review, it was possible to identify what are the objectives of public procurement and consequently the objectives of the procurement process of the Italian universities. Also thanks to the analysis carried out in the second chapter, it was possible to understand the context of the procurement process of the Italian universities, and what are its most critical points and consequently formulate our research questions inspired by some authors, that in their research have dealt with the issue of the buying process in universities.

Research Question	**Literary source**
Which are the characteristics of the procurement process of Italian universities, and how its management is affected by the level of centralization, digitalization and formalization?	Agasisti and Cavazzana (2015) Barbieri and Zanoni (2005)
How to measure procurement performance in Italian universities?	Barbieri and Zanoni (2005) Erridge (2007) Walker and Brammer (2007). Thai (2008)

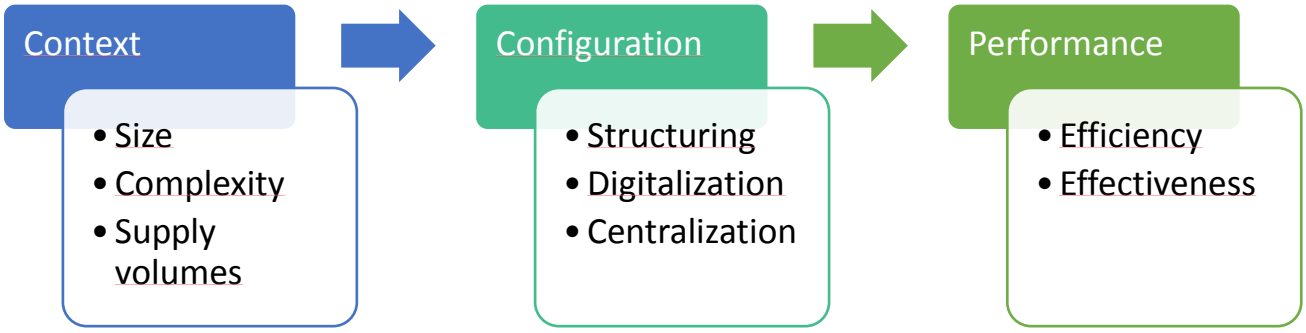
Table 2 Literary sources for the resarch questions

4.3 Definition of the research framework

After defining the research objectives and the questions to which the work will have to give an answer we created a data analysis model that can guide the various phases of the work on the project Good practice and the analysis of results. As already seen in the second chapter, the procurement process is influenced by the context surrounding it (Thai 2008) and so our framework tries to define the contest of the process. In the case of university procurement process, the context can be defined based on variables that describe the university context such as the size of the university, the complexity of the context and the volume of supply. It is supposed that these context variables can affect the organizational configuration and the characteristics of the procurement process, according to the researches of Agasisti and Cavazzana (2015) and Barbieri and Zanoni (2005). Having identified the various organizational and technological configurations within the Italian universities, such as

centralization, digitalization and formalization of the procedures; the model seeks to understand the impact that these have on the performance of the process in terms of efficiency and effectiveness.

Figure 2 research Framework



As far as the context variables, the size of the university is evaluated based on the number of the university students and the number of staff. The complexity of the university is evaluated based on the number of departments, given that as the number of departments increases the differentiation of purchases and consequently increases also the complexity of the process. Instead, the supply volumes of the various universities are defined as supply volumes per student.

As said before, the model also tries to identify the impact of the various organizational and technological configurations on process performance in terms of efficiency and effectiveness. The efficiency of the process is measured by the total cost and unit cost of the process, while the effectiveness is considered as a user satisfaction level.

4.4 Data Collection

This section describes the data collection phase and the sample of universities that was the subject of our research.

4.4.1 The university sample

It was selected by the project Good practice a sample of eleven Italian universities (UNIBR, UNICAF, UNIFR, UNINS, UNIAV, UNIPM, UNIPT, UNIBIC, UNIBOL, UNIPAV, UNIVPB) on which the research will focus. The sample contains scattered geographically universities of different sizes, ages and discipline orientation. The sample universities are distributed in this way, 80% are universities of northern Italy and the remaining 20% of the center-south. Regarding the age of the universities, about 40% is old age, that is founded before 1900 and the remaining part of the sample are young universities. With regard to disciplines, 54% of the sample are scientific humanistic universities, 36% technical and scientific universities and only one university includes both technical and scientific disciplines and humanistic.

4.4.2 Data Collection

We have collected data on the sample universities in order to reap the results. The data collection took place in two parallel modes, a first mode is that of a direct search of information on universities through the various websites of the universities and the site ba.miur from which we obtained the university budget data. This mode was used for information about the context variables, so in order to describe the context of the procurement process of the Italian universities.

The second technique used for the data collection was the questionnaire (Appendix), were drawn two questionnaires from Good Practice project, which will be described below. The questionnaires were emailed to the various universities of the sample to obtain information in order to understand how it is structured the procurement process and the different organizational and technological configurations of the process. Based on the responses received will be processed the search results. identify the various configurations of organizational and technological universities.

Questionnaire 1:

Regarding the questionnaire 1 the first part of questions concerns the characteristics of the university, a second part seeks to understand how the university manages the procurement process, then the last part tries to determine the level of digitalization of the buying process. Below are the questions.

Questionnaire 2:

The questions of the second questionnaire offer the same concepts of the first questionnaire focusing more on the level of centralization of purchases of the university and the level of digitalization of the procurement process.

4.5 Result Analysis

In this section we explain what are the steps that have allowed us to arrive to search results.

4.5.1 First research question

Regarding the first research question, we analyzed the data, that allow us to define the context variables, and thus describe the context of the process. Once defined our three contextual variables, we tried to understand the correlation that exists between the three through a graph drawn with Microsoft excel.

In order to answer the second part of the question, we analyzed the two questionnaires, and created clusters of questions that allow us to define the indicators to describe the organizational and technological configuration of the process and therefore establish the level of centralization, structuring and digitalization of the purchase process of Italian universities. Three clusters of questions were then created, once selected the questions to be included, were defined the parameters for the answers to the questions based on which calculate the results.

The centralization cluster is composed of only one question, while that of structuring by five questions and that of the digitalization by two questions. For clusters consisting of several questions the level of the indicator was calculated as the arithmetic mean of the results of the various questions of the cluster.

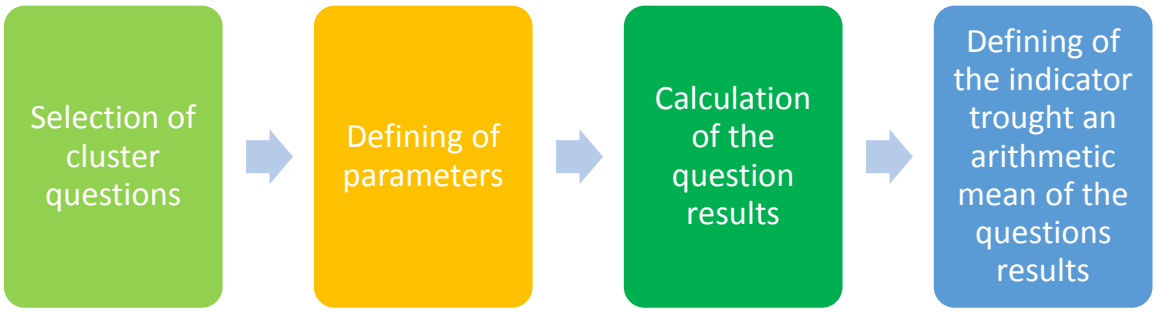


Figure 3 Procedure to calculate the indicators value

Later, again through graphics elaborated with Microsoft excel, we tried to understand the correlation between the indicators and context variables to understand what is the impact of the latter on the various configurations of the buying process.

4.5.2 Second research question

Regarding the second question of research we decided to measure the performance in terms of efficiency through the unit cost, obtained from the ratio between the total cost of the process and the volume of supply, the data are obtained from the university budgets. On the other hand, with regard to the performance of the process in terms of effectiveness, this is measured according to the satisfaction of the university of the process performance. In a second part we try to understand the impact of different organizational and technological configurations of universities on the process performance through graphs elaborated with Microsoft excel showing the correlation of centralization, structuring and digitalization with the unit cost of the universities purchasing process and user satisfaction.

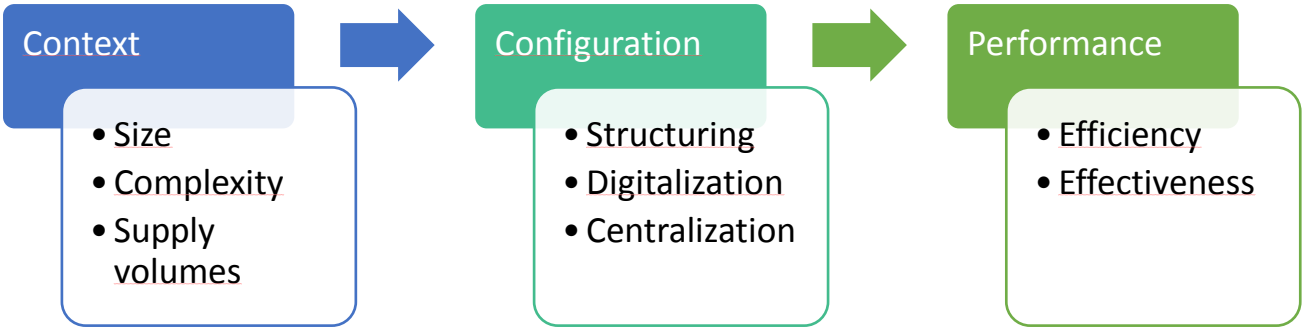
5 Framework and data analysis

In this chapter in the first part is defined the research framework based on the objectives of the work set in the third chapter. In a second part it is described how were calculated the indicators for each block of the model, in order to then be able to give a response to the research questions. Particularly, first we collected data on the eleven universities in the sample to define the indicators of the first block (5.2). A third paragraph is dedicated to the second block of the framework, with the analysis of the two questionnaires and their integration and the creation of clusters of questions that can allow us to define the indicators, with which describe the process of supply of universities, then the indicators identified were calculated for each of the sample universities, and is reported in section 5.3 the mode and parameters used. In the paragraph 5.4 it is described how we defined the indicators with which measure the performance of the process. As a last step, universities were grouped into clusters based on their characteristics, and calculated the three indicators for each cluster identified (5.5).

5.1 The research framework

As we saw in chapter two, based on the analysis of the literature, the procurement process is influenced by the surrounding context, so the first block of our framework will handle the description of the context in which is located the university buying process, and understand its impact on the various organizational and technological configurations of the process. Goal of our research is the characterization of the purchasing process of the Italian universities, in relation to this, the second block of our model of analysis, will attempt to define the characteristics of the process in terms of organizational and technological configuration.

As said in chapter three, the main objectives that the public procurement now proposes are the increase of the efficiency and effectiveness of the process (Thai 2008), indeed the second objective of our research is to understand how to measure the performance of the procurement process of the Italian universities, and measure the impact of the various organizational choices on performance. For this reason, the last block of our framework try to measure the performance of the purchasing process within Italian universities in terms of efficiency and effectiveness.



The following paragraphs contain the data with which they were defined, the indicators set out in the various blocks of the framework.

5.2 Research data about context factors and characteristics of universities

First, we gathered information about the eleven universities defined by the sample, which could support their specific characterization. The information was obtained from the university sites. In particular, we have defined:

- Number of students enrolled
- Number of registered students
- Number of foreign students
- Number of staff
- Percentage of personnel for student
- Number of degree courses
- Number of departments
- Number of locations
- Year of foundation of the university
- membership region
- Type of disciplines

Thanks to this data we have defined contextual variables for the eleven universities. In particular, we defined the **size of the university** through the correlation between the number of students enrolled and the number of the staff (Table 3).

The second contextual variable, the **complexity of the context**, is defined through the number of departments within the university, given that as the number of departments increases, increases also the variability of the needs and purchases and thus also the complexity of the procurement process (Table 4).

The third variable, **volume of supply per student**, is calculated trough the ratio between the total cost of supply and the number of students (Table 3, Table 5)

The tables below show the data found:

University	Students enrolled	Registered St.	Foreign St.	N. staff
UNIBIC	32340	9529	1884	2182
UNIBOL	80924	21791	5634	8392
UNIBR	14619	3151	1099	2223
UNICAF	19460	6473	1058	1672
UNIFR	50440	10256	3751	4771
UNINS	8917	2473	561	956
UNIAV	4327	1437	261	1249
UNIPAV	22200	6237	1440	2834
UNIPB	10984	2458	86	617
UNIPM	40453	13431	4272	4591
UNIPT	31189	9355	4919	2538

Table 3 University data first part

University	Courses	Departments	N. Locations	Foundation year	Region	disciplines
UNIBIC	71	14	3	1998	Lombardia	scientific humanistic
UNIBOL	413	33	5	1088	Emilia-Romagna	scientific humanistic
UNIBR	48	8	4	1982	Lombardia	scientific humanistic
UNICAF	45	8	1	1868	Veneto	scientific humanistic
UNIFR	70	24	10	1321	Toscana	scientific humanistic
UNINS	35	7	4	1998	Lombardia	scientific humanistic
UNIAV	35	3	3	1926	Veneto	technical and scientific
UNIPAV	84	18	2	1361	Lombardia	Hum.-tecn.-scientific
UNIPB	24	5	6	1990	Puglia	technical and scientific
UNIPM	99	12	5	1863	Lombardia, Emilia-Romagna	technical and scientific
UNIPT	107	11	5	1906	Piemonte	technical and scientific

Table 4 University data second part

The second phase of universities characterization was that of understand how it is structured the expenditure of the various universities, the balance sheet data of the various universities were then collected. The information was taken from the site ba.miur.it by analyzing the budget expenditure, with particular attention to the total costs and the total cost of supply. The table below reports the data we have found.

University	Total costs	Total costs of Supply k€	costs of Supply per student	Unit cost	satisfaction
UNIBIC	1,183,403	43,119	1.33	27.445	3.20
UNIBOL	5,024,354	90,771	1.12	55.352	3.77
UNIBR	975,504	27,325	1.87	35.700	3.73
UNICAF	632,659	32,237	1.66	19.626	3.59
UNIFR	2,135,840	85,187	1.69	25.072	3.17
UNINS	787,535	14,516	1.63	54.253	3.71
UNIAV	247,392	7,667	1.77	32.268	3.00
UNIPAV	979,610	16,640	0.75	58.871	3.44
UNIPB	480,285	18,654	1.70	25.747	3.21
UNIPM	1,597,064	60,099	1.49	26.574	_ _ _
UNIPT	1,464,514	37,555	1.20	38.997	3.97

Table 5 University data third part

5.3 Organizational and technological configuration of the process

This section describes the steps that have led us to define the three indicators of centralization, structuring and digitalization that allow us to define the configuration of the procurement process of the Italian universities both in organizational and technological terms. In a first phase the two questionnaires were analyzed and integrated, they were later created the cluster of questions that allow us to define the level of the three indicators for each university of the sample and as a last step comes the definition of indicators and calculation of results for the various universities.

5.3.1 Integration of the questionnaires

Since the two surveys are similar, we have analyzed the various questions of the two questionnaires. We have eliminated the questions that had as its goal the description of the university, since this information had already been found in the phase of data collection on universities. Then were eliminated some questions, not deemed relevant for the research and finally eliminated questions that were repeated in the two questionnaires, the answers to which gave us the same information.

Questionnaire 1 changes:

- Questions 1 to 6 were eliminated because descriptive of the universities.
- Question 11 has been replaced by the question 6Q2.
- Question 21 has been replaced by question 7 Q2 because it allows a more detailed answer.
- Question 22 was replaced by the question 8Q2.
- The question 23 was replaced by 9Q2 because it allows a more detailed answer.
- The question 24 was replaced by 10Q2 because it allows a more detailed answer.
- Questions 25 and 26 were eliminated because considered of little importance for research.
- Questions 27 and 29 have been replaced by 6Q2 as the question include them.
- The question 28 was replaced by 11Q2 because it allows a more detailed answer.

Questionnaire 2 changes:

- The question 1Q2, was eliminated because descriptive of the university.
- The question 3Q2, has been replaced by 12Q1 question.
- The question 4Q2, has been replaced by questions 15Q1 e16Q1.
- The question 5Q2, has been replaced by 17Q1 and 18Q1 questions.

5.3.2 Creation of the cluster of questions

The next step was to clumping the questions into clusters in order to define the indicators by which it will be possible to describe the procurement process of each university. This will enable us to understand the characteristics of the process and be able to answer the first question of our research. The goal of all public authorities is to rationalize their own costs, and achieve maximum effectiveness and efficiency in the procurement process. As seen in Chapter 2, in the literature on the subject, it is considered that the measures of process centralization, adoption of new technologies and structuring of the purchasing process allow to reach the goal that the state has set about the public expenditure. In view of all this, these three indicators chosen were: centralization, digitalization and structuring according to whom the questions clusters were formed.

Cluster 1 (Centralization)

To define how much the process is centralized, it was chosen the question twelve of the questionnaire "Purchases of universities survey ".

Question	Answers
In your university, there is an office dedicated to the management of purchases?	Yes, there is a central office dedicated to the management of all the University's purchases
	Yes, both the Central Administration that each Department have offices dedicated to purchasing management
	Yes, in the Administration Center there is a Purchasing Office, while in the Departments are not always present a structured office
	No, there is not a purchasing office and each directorate and each department manages independently purchases

Table 6 Centralization cluster

Cluster 2(Structuring)

To define the level of structuring of the process, we used questions 10Q1, 12Q1, 17Q1, 18Q1, 19Q1.

Questions	Answers
What is the level of standardization in the purchasing procedures management in your University? **10Q1**	High (most of the procedures are formalized)
	Medium (existence of a number of formal procedures)
	Low (there are few formal procedures)
In your university, there is an office dedicated to the management of purchases? **12Q1**	Yes, there is a central office dedicated to the management of all the University's purchases
	Yes, both the Central Administration that each Department have offices dedicated to purchasing management
	Yes, in the Administration Center there is a Purchasing Office, while in the Departments are not always present a structured office
	No, there is not a purchasing office and each directorate and each department manages independently purchases
There is a structured system, even non-computerized, for the detection of needs? **17Q1**	Yes, for most of the types of goods / services purchased
	Yes,for some types of goods / services purchased
	No
You make a program of requirements (at least for a product category)? **18Q1**	Annual
	four-monthly
	No
At the end of the buying process, it is carried out a structured assessment of the supplier's level of service? **19Q1**	Yes, for all purchases
	Yes, but only for certain purchases
	No

Table 7 Structuring cluster

Cluster 3 (Digitalization)

To define the level of digitalization of the purchasing process within universities were used, the questions 15Q1 and 6Q2.

Questions	Answers
The documents and information flows of the following phases of the buying process, are supported by IT solutions? (Analysis of the University purchase requirements, definition of specifications and functionality, choice of award procedure, search suppliers, Definition of tender specifications, the tender stage management, analysis of the purchasing process performance, administrative management of the contract, operational management contract) **15Q1**	No, and we do not think to implement it
	No, but we are evaluating the implementation
	Under implementation / testing
	Yes, but it is used only by some Directorates / Departments
	Yes, and it is adopted by the entire university
What percentage of the total number of purchases are made on electronic platforms (Compared to the total expenditure, compared to total purchases)? **6Q2**	1%-25%
	26%-50%
	51%-75%
	above il 75%

Table 8 Digitalization cluster

5.3.3 Definition of the Indicators

After receiving the replies of the various questionnaires by the universities it was possible to calculate the value of process indicators for each university. This section explains how the various indicators are calculated and what parameters were used for the calculation.

5.3.3.1 Centralization

We remind the definition of centralization present in the second chapter "The centralization of purchasing process consists in aggregating demand and needs, thus creating unique purchase power plants. This creates a considerable advantage especially for large organizations organized in more than a structure such as universities. In a ***Centralized structure***: all purchases are managed by a central office, it occurs when all of the rights, powers, duties, and authority are vested in a central procurement officer.

Now we report the parameters used to define the level of centralization of the purchasing process based on the response of the university.

Answers	Parameters
Yes, there is a central office dedicated to the management of all the University's purchases	1
Yes, both the Central Administration that each Department have offices dedicated to purchasing management	0.5
Yes, in the Administration Center there is a Purchasing Office, while in the Departments are not always present a structured office	0.25
No, there is not a purchasing office and each directorate and each department manages independently purchases	0

Table 9 Centralization parameters

Centralization level

University	Answer	Centralization
UNIBIC	0	0
UNIBOL	0.25	0.25
UNIBR	0.5	0.5
UNIFIR	0.25	0.25
UNINS	0.25	0.25
UNIUA	1	1
UNIPAV	0	0
UNIPB	1	1
UNIPM	0.25	0.25
UNIPT	0.25	0.25
UNICAF	0.25	0.25

Table 10 Centralization Level

As shown in the graph below the Bicocca and Pavia universities have a decentralized structure, while UNIUA and UNIPB have a centralized structure. the rest of the sample universities adopt a hybrid structure for the procurement process.

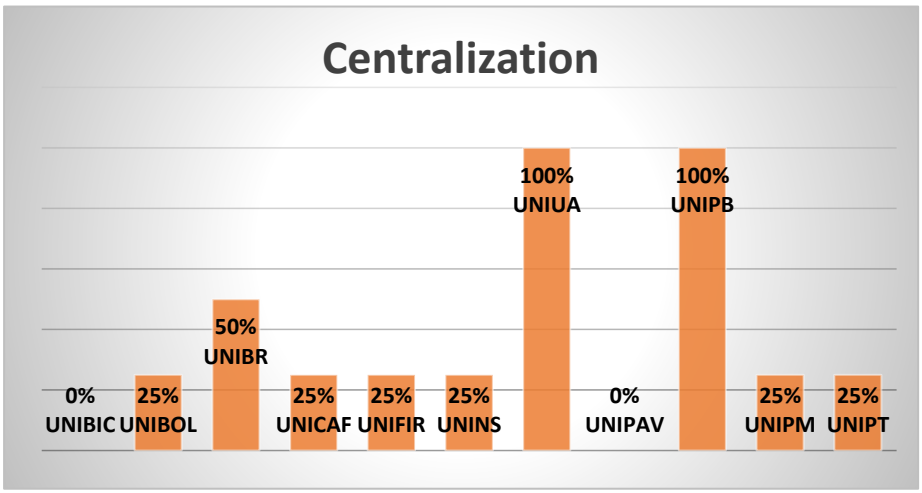


Figure 4 Centralization level

5.3.3.2 Structuration

Now we define the degree of structuring of the process that goes to identify how much the process is standardized and formalized in particular: definition of procedures, defined division of responsibilities, skills identification, ex ante programming and evaluation.

Questions	Answers	Parameters
10Q1	High (most of the procedures are formalized)	1
	Medium (existence of a number of formal procedures)	0.5
	Low (there are few formal procedures)	0
12Q1	Yes, there is a central office dedicated to the management of all the University's purchases	0
	Yes, both the Central Administration that each Department have offices dedicated to purchasing management	0.5
	Yes, in the Administration Center there is a Purchasing Office, while in the Departments are not always present a structured office	1
	No, there is not a purchasing office and each directorate and each department manages independently purchases	1
17Q1	Yes, for most of the types of goods / services purchased	1
	Yes, for some types of goods / services purchased	0.5
	No	0
18Q1	Annual	0.5
	four-monthly	0.8
	No	0
19Q1	Yes, for all purchases	1
	Yes, but only for certain purchases	0.5
	No	0

Table 11 Structuring parameters

Now we report the results obtained through their replies on the structuring of the process level for the eleven universities

Structuring =[10Q1+12Q1+17Q1+18Q1+19Q1] \ 5 = n %

University	10Q1	12Q1	17Q1	18Q1	19Q1	Structuring
UNIBIC	1	0	0.5	0.5	0.5	0.5
UNIBOL	0.5	0.5	0.5	0.5	0.5	0.5
UNIBR	1	1	0.5	1	0.5	0.8
UNIFIR	0.5	0.5	0.8	1	0.5	0.66
UNINS	0.5	0.5	0.5	1	0.5	0.6
UNIUA	1	1	0.5	0.5	0.5	0.7
UNIPAV	0.5	0	0.5	0.5	1	0.5
UNIPB	0	1	0	0	0	0.2
UNIPM	1	0.5	0.5	0.5	0	0.5
UNIPT	0.5	0.5	0.5	0	0	0.3
UNICAF	0.5	0.5	0.5	0.5	0	0.4

Table 12 Structuring level

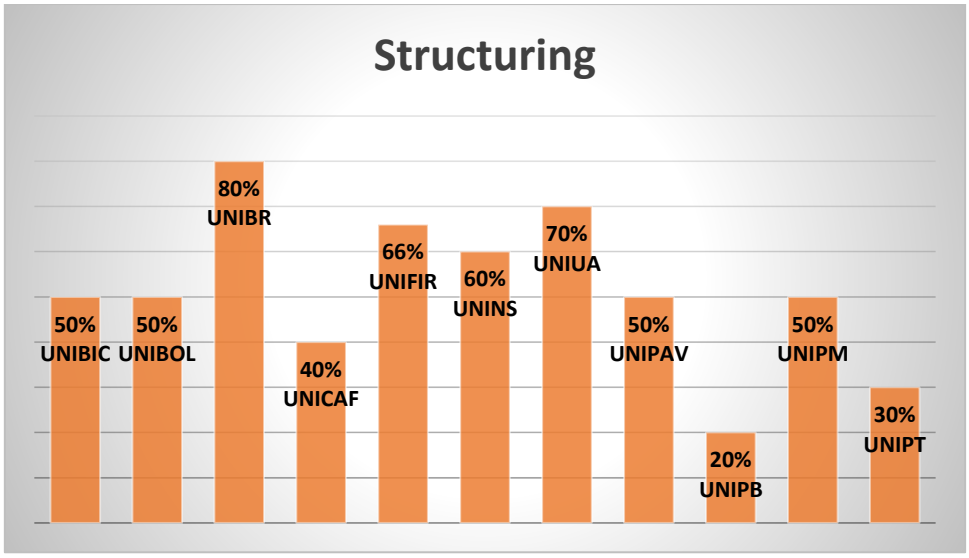


Figure 5 Structuring level

We can notice from the graph, that most of universities have high level of structuring, only three go below the 50%.

5.3.3.3 Digitalization

Now let's see what the answers of the universities tell us, about the level of digitalization of the purchasing process, that is meant as the level of digitalization of the procedures of procurement and the level of use of e-procurement systems within the various universities.

Questions	Answers	Parameters
15Q1	No, and we do not think to implement it	0
	No, but we are evaluating the implementation	0.3
	Under implementation / testing	0.5
	Yes, but it is used only by some Directorates / Departments	0.8
	Yes, and it is adopted by the entire university	1
6Q2	1%-25%	0.3
	26%-50%	0.5
	51%-75%	0.8
	above il 75%	1

Table 13 Digitalization parameters

Now it is reported how the results of the two questions were calculated, in order to define the digitalization level of the procurement process for each university.

$$\mathbf{15Q1 = [\ \Sigma_i x_i] \setminus 9}$$

$$\mathbf{Digitalization = [\ 15Q1 + 6Q2] = [\ 15Q1 + (y_1 + y_2)] \setminus 3 = n\ \%}$$

University	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8	X_9	15Q1
UNIBIC	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
UNIBOL	0.3	0	0	1	0	0	0	0.3	0	0.177778
UNIBR	0.3	0.3	0	1	0	0.8	0	1	0.3	0.411111
UNIFIR	0.5	0.5	0.5	0.8	0.8	0.8	0.5	0.5	0.5	0.6
UNINS	0	0	0	1	0	0	0	1	0.5	0.277778
UNIUA	0.3	0.3	0.3	0.8	0.3	0.8	0.3	0.3	0.3	0.411111
UNIPAV	0.5	0	0	1	0	0	0.5	1	0	0.333333
UNIPB	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0	0	0.233333
UNIPM	0.3	0.5	0.5	1	0	1	0.5	0.5	0	0.477778
UNIPT	0.3	0	0	0	0	0	0.3	0	0.3	0.1
UNICAF	0.3	0	0	1	0	1	0.3	1	0	0.4

Table 14 Question 15Q1 results

University	y_1	y_2	15Q1	Digitalization
UNIBIC	0.8	0.8	0.3	0.633333
UNIBOL	1	0.3	0.177778	0.492593
UNIBR	1	0.8	0.411111	0.737037
UNIFIR	0.8	0.8	0.6	0.733333
UNINS	1	0.8	0.277778	0.692593
UNIUA	1	1	0.411111	0.803704
UNIPAV	0.3	0.8	0.333333	0.477778
UNIPB	0.8	0.8	0.233333	0.611111
UNIPM	1	0.8	0.477778	0.759259
UNIPT	0.3	1	0.1	0.466667
UNICAF	1	0.8	0.4	0.733333

Table 15 Digitalization level

As the graph below shows the sample universities have a high level of digitalization, only three universities have a level of digitalization that's go below the 50%.

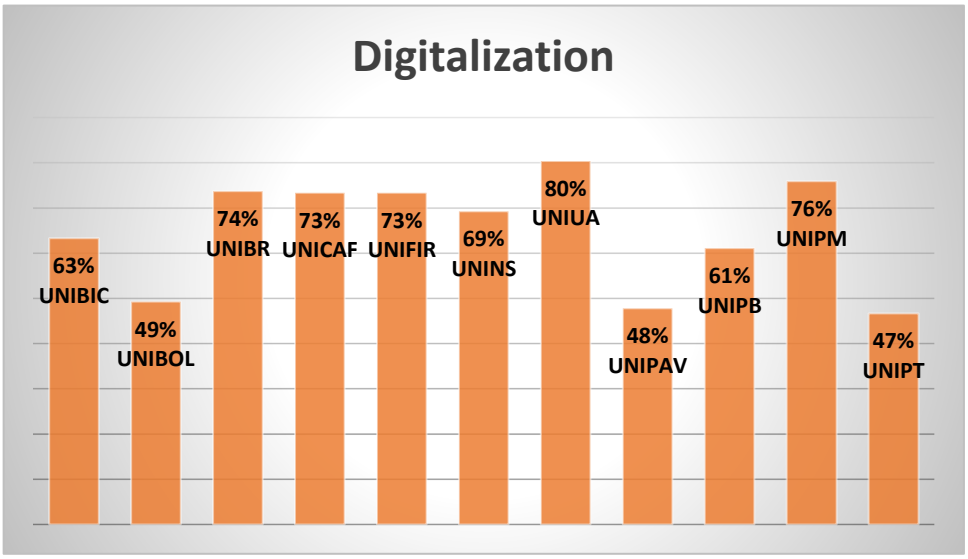


Figure 6 Digitalization level

5.4 Measurement of the process performance

The indicators by which we measure the performance of the process are the efficiency and effectiveness of the process. The **efficiency of the process** is measured in terms of cost so we use as a measure the unit cost of the procurement process calculated as the rapport between the total cost of the process and the supply volumes (Table 5).

The other indicator, **effectiveness of the process**, is measured in terms of quality of the process and so we use the satisfaction of the users to determinate it (Table 5).

5.5 University Clusters

They were also created clusters of universities, based on their age, geographical location and disciplines. The intent was to understand how the three indicators behave in relation to the universities clusters.

Geographical cluster

We have divided the universities according to their respective region, in particular in two groups: Northern universities and universities of the center-south.

Northern universities	UNIPAV	UNIBOL	UNIBIC	UNIPT	UNIUA	UNICAF	UNINS	UNIBR	UNIBR
Center-south Universities	UNIPB	UNIFIR							

Table 16 Geographical clusters

The indicator of a cluster was calculated as

Indicator = [Σi Ind]/number of the cluster universities

For example, digitalization of center-south universities = (Dig. UNIPB+ Dig. UNIFIR)/2

INDICATOR\UNI	Northern Universities	Center-south Universities
Centralization	30%	62.5%
Structuring	53%	43%
Digitalization	64%	67%

Table 17 Geographical cluster indicators

Age clusters

In these clusters universities are divided into two groups according to their age: universities founded before 1900 were clustered in the old university cluster and those founded after 1900 were included in young university cluster.

To calculate the indicators, it used the same formula as before.

Indicator = [Σi Ind]/number of the cluster universities

Old Universities	UNIPM	UNIBOL	UNIPAV	UNIFIR	UNICAF	
Young Universities	UNIBIC	UNIPT	UNIVIUA	UNIPB	UNIBR	UNINS

Table 18 Age clusters

INDICATOR\UNI	Old Universities	Young Universities
Centralization	20%	50%
Structuring	51%	51%
Digitalization	63%	65%

Table 19 Age clusters indicators

Discipline cluster

The universities were divided into groups according to their disciplines, particularly the humanistic scientific and technical scientific. Also here, we used the same formula for the calculation of the indicators.

Indicator = [Σi Ind]/number of the cluster universities

uni HUM/SC	UNIBR	UNICAF	UNIFIR	UNIBIC	UNIBOL	UNIPAV	UNINS
uni TC/SC	UNIUA	UNIPM	UNIPT	UNIPAV	UNIPB		

Table 20 Discipline clusters

INDICATOR\UNI	Uni. HUM/SC	Uni. TC/SC
Centralization	21%	50%
Structuring	56%	44%
Digitalization	63%	62%

Table 21 Discipline clusters indicators

6 Discussion of the results

In this section, we discuss the results obtained from effectuate analysis on the responses obtained by the universities, based on the research questions as defined in paragraph 3.2.

This section tries to give an answer to the questions that has set the search. We recall here the two questions on which we base our analysis.

1- Which are the characteristics of the procurement process of Italian universities, and how its management is affected by the level of centralization, digitalization and formalization?

2- How to measure procurement performance in Italian universities?

6.1 First research question " Which are the characteristics of the procurement process of Italian universities, and how its management is affected by the level of centralization, digitalization and formalization? "

In this section we try to answer the first question by describing the context of the process and the process itself based on the data that the research provides. And therefor following the first two blocks of our framework, that is, the environment and configuration.

6.1.1 Contextual factors

Let's start with the description of contextual factors of the procurement process, following the first part of the analysis framework. In particular, we focus on the size of the university, the complexity of the university and the procurement volumes.

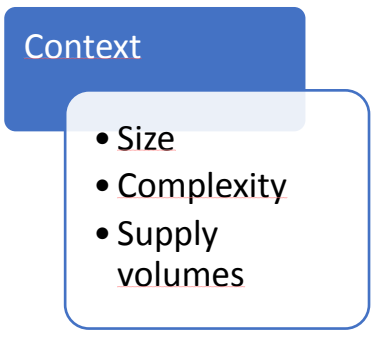


Figure 7First block of the framework

Size of the universities

We can define the size of the universities based on the number of students enrolled and the total number of staff as the following graph shows.

The graph shows this classification

Large universities: UNIBOL

Medium universities: UNIFIR, UNIPM, UNIBIC, UNIPT, UNIPAV.

Small universities: UNICAF, UNIBR, UNIPB, UNINS, UNIUA.

So most of the sample universities are small-medium sized, the only exception is the University of UNIBOL, which has large size.

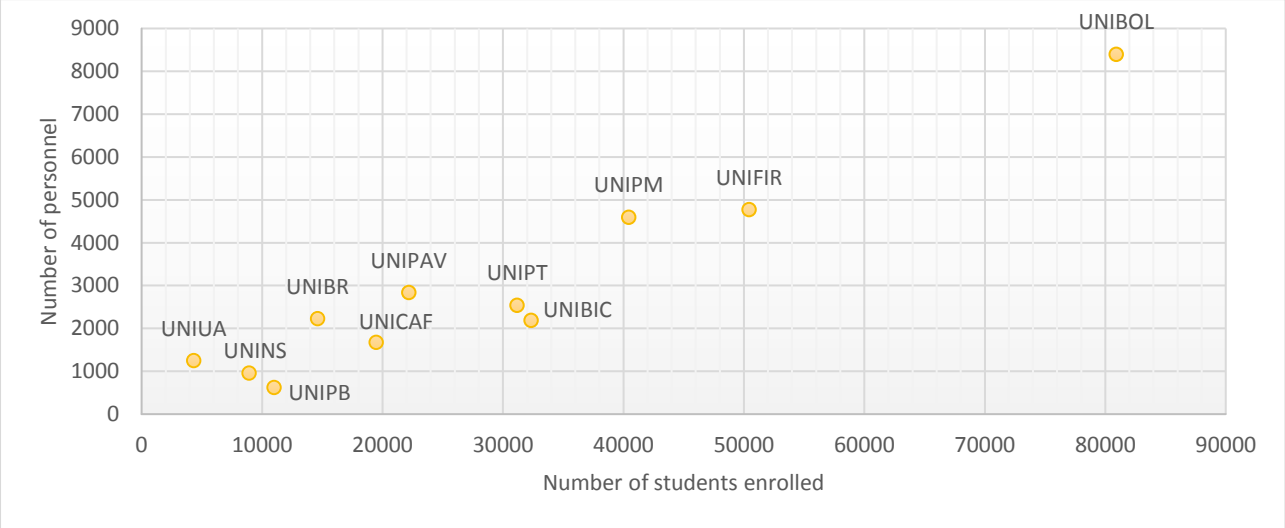


Figure 8University size

Context Complexity

The complexity of the context of the process or in other words the complexity of the university was evaluated based on the number of departments of the university, in fact the greater the number of departments greater is the fragmentation of the needs and demand**,** and so the complexity.

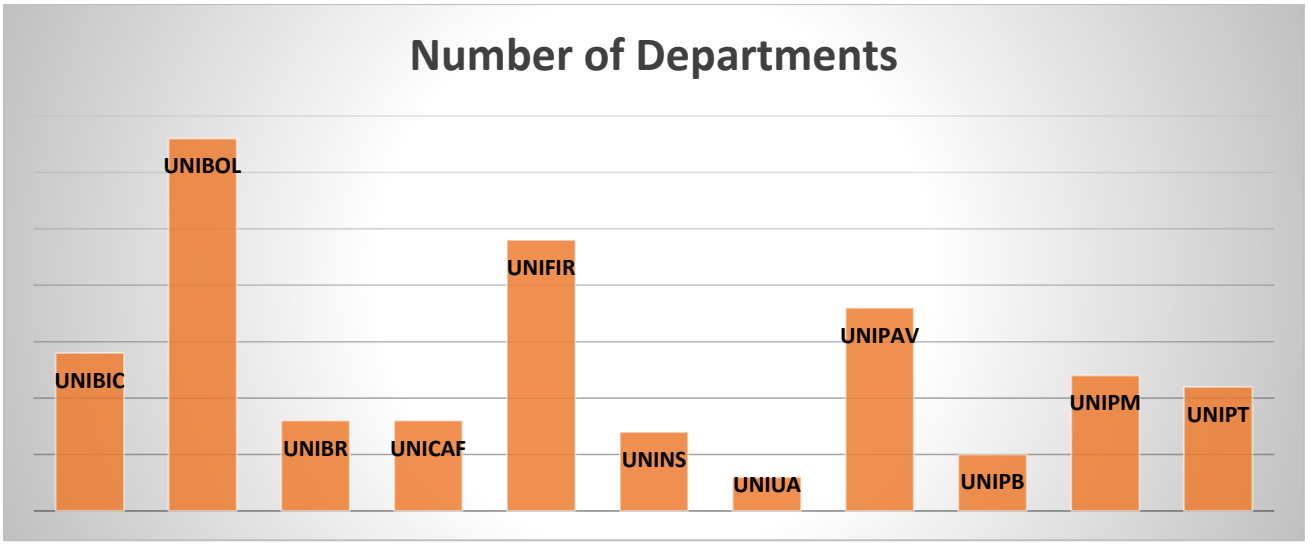


Figure 9 Number of departments(Complexity)

As the data of the chart show, the number of departments, and thus the complexity of the context is high for large and medium universities, while the universities characterized by small size, such as UNIUA, UNIPB and UNIBR have a low complexity.

Procurement volumes

Another important indicator to be able to describe the context of the procurement process is definitely the volume of purchases. The data were obtained from university budgets and are presented in the chart below.

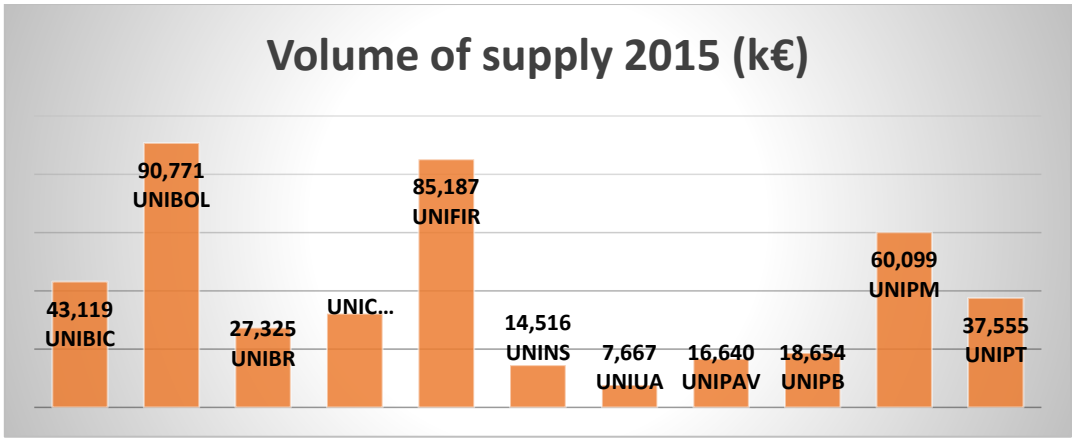


Figure 10 Volume of supply 2015

This chart shows the supply costs sustained by the universities for the individual student.

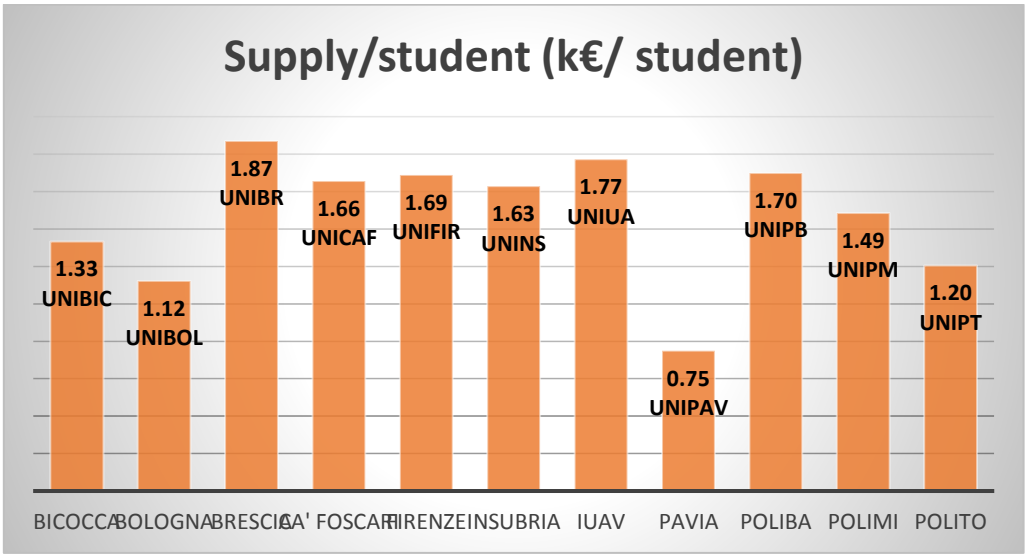


Figure 11 Value of supply per student

Now we try to correlate the above data. The following graph shows the relationship between university size, university complexity and cost of supply that the university supports for the individual student. As the chart shows the small universities are those who support a higher procurement cost / student. As more the size of the university increases, increases the complexity of the context and decreases the supply cost per student.

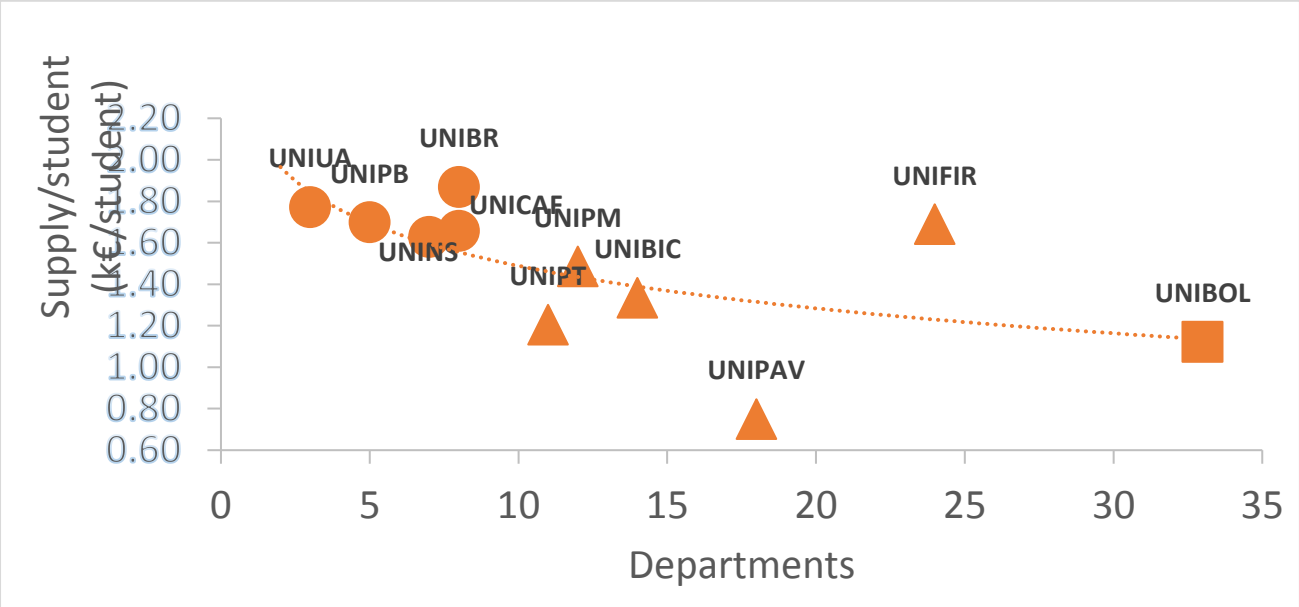


Figure 12 Correlation between volumes of supply, size and complexity

6.1.2 Organization of the procurement process within Italian universities

In this section we try to answer the second part of the first question, describing always based on the data available and the second part of our framework, the organizational setup of the process meant as the level of centralization and level of structuring. And describing the technological configuration of the process, and thus the degree of use of e-procurement systems.

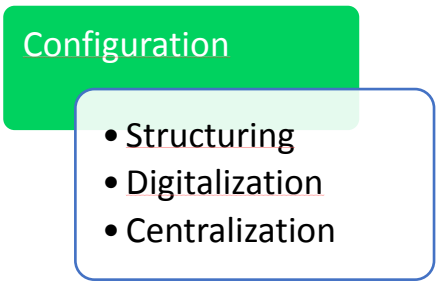


Figure 13 Second block of the framework

Level of centralization

As we saw in Section 5.3.3.1 universities have different levels of process centralization.

Centralized universities: UNIUA, UNIPB.

Hybrid universities: UNIBOL, UNIBR, UNICAF, UNIFIR, UNINS, UNIPM, UNIPT.

Decentralized universities: UNIBIC, UNIPAV.

We try now to understand the correlation between the level of centralization and the contextual factors that we have seen before. The chart below analyzes the relationship between centralization of the process, size and complexity of the university.

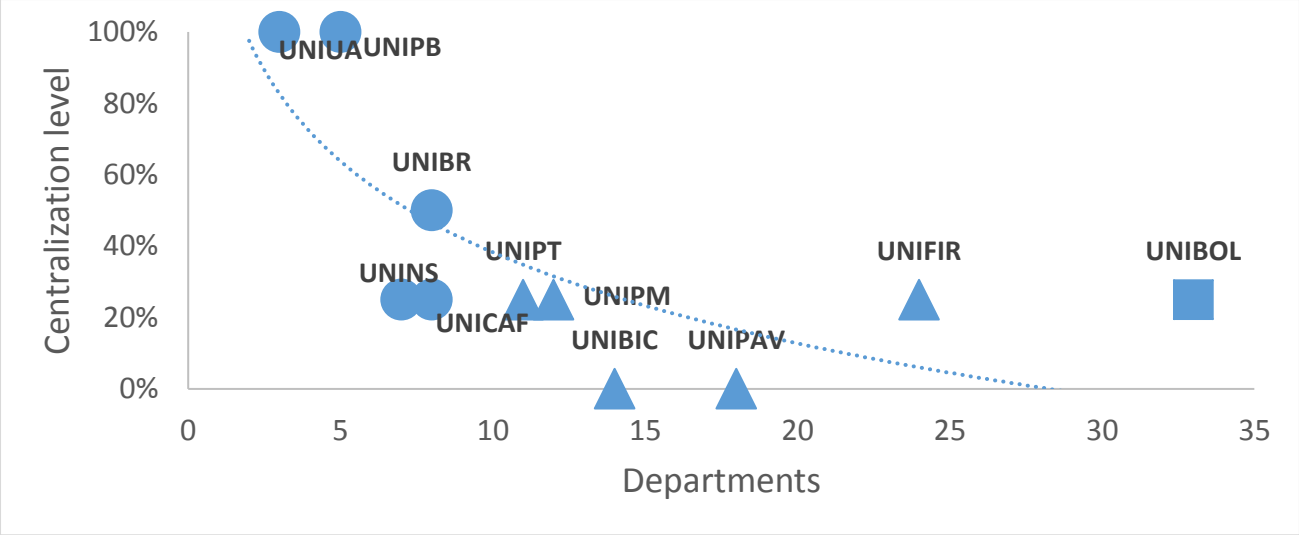


Figure 14Correlation between centralization level, size and complexity

University of small size and low complexity have a high level of centralization of the process, instead medium and large universities with high complexity have a low centralization of the process. The graph shows that the level of centralization decreases with the increase of the size and the complexity. Now let's see, again through a chart, how the centralization behaves in relation to the supply cost per student.

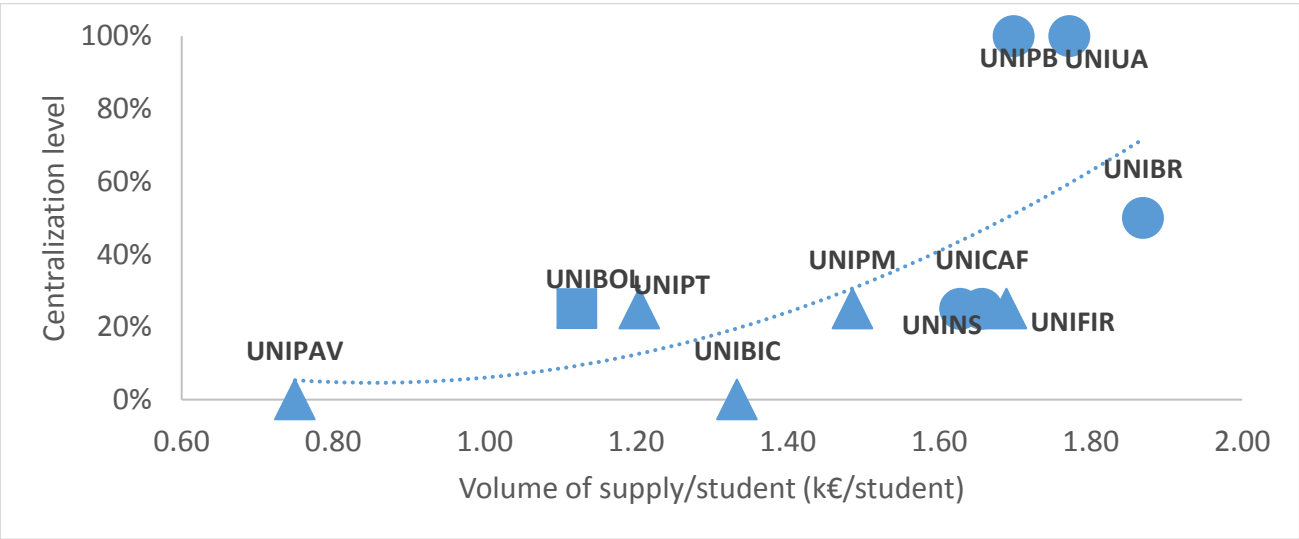


Figure 15 Correlation between centralization level,size and volume of supply

The centralization level increases with the increase of the supply volume per student.

Level of Structuring

As seen in section 5.3.3.2 the degree of structuring of the procurement process is quite high for almost all sample universities, only the University of UNIPT, UNIPB and UNICAF go below 50%. As we did previously, let us now try to understand the correlation between the level of the structuring process and the contextual factors of size, complexity and volumes of supply per student.

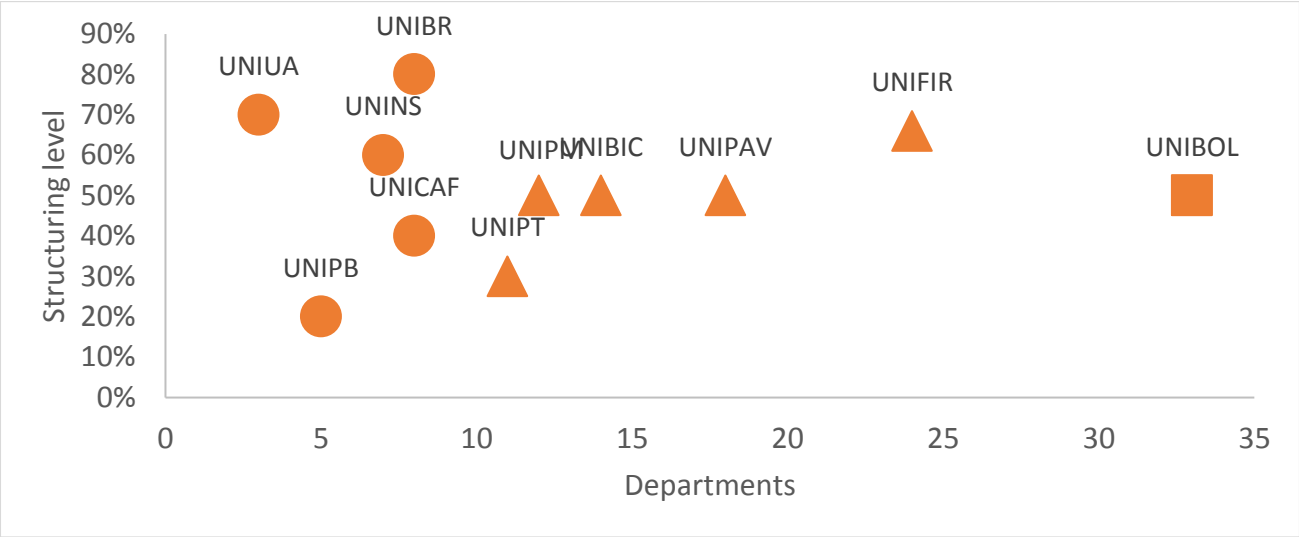


Figure 16 Correlation betweenStructuring level and complexity

From the graph does not appear to be a particular correlation between the degree of structuring of the process and the size and complexity of the university. The graph below however, shows that universities with higher level of structuring have higher volume of supply per student.

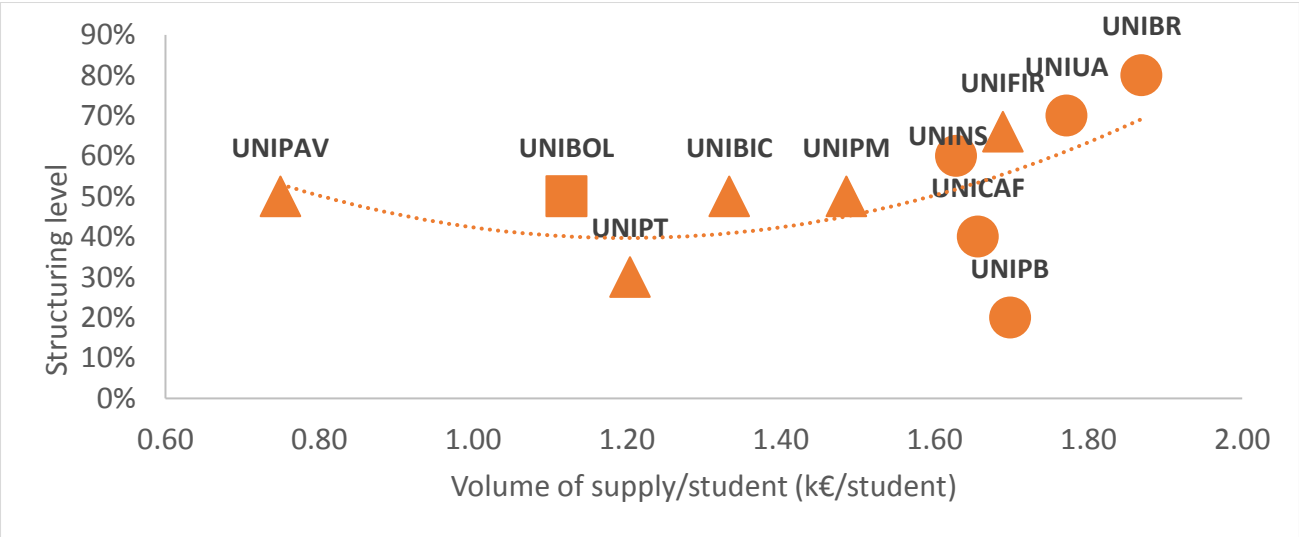


Figure 17 Correlation between Structuring level and volumes of supply

Level of Digitalization

The level of digitalization of the process is understood as the level of use of technology and e-procurement systems for the purchase process of universities. As we saw in paragraph 5.3.3.3 all universities have a good level of digitization and then all use e-procurement systems at least for some of their purchases. Now we will check the correlation between the level of digitization and the various contextual factors.

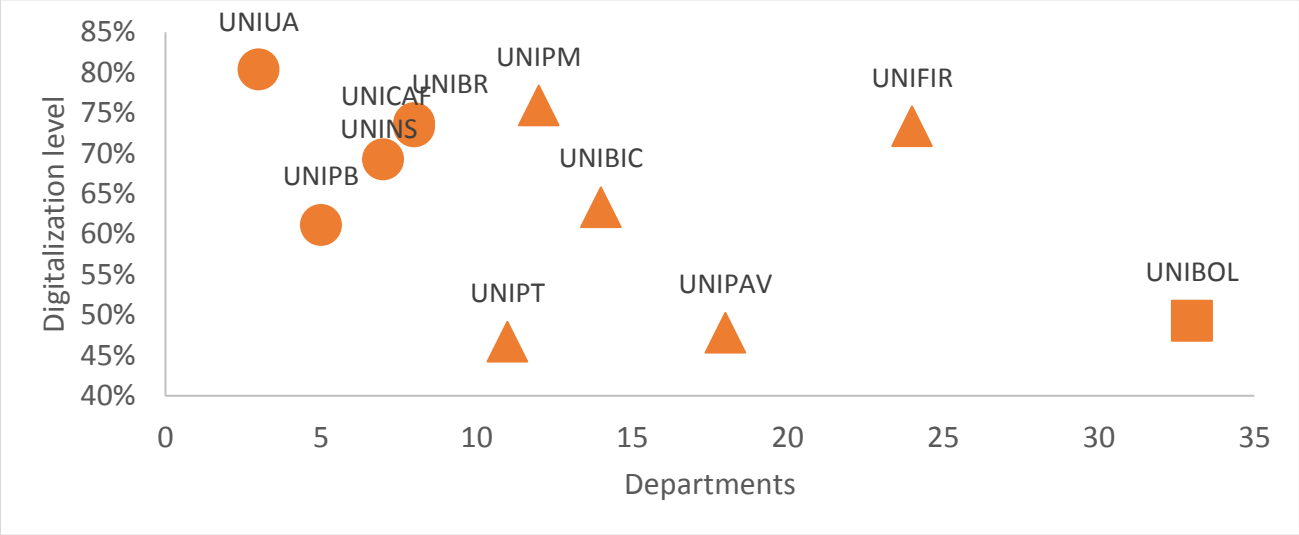


Figure 18 Correlation between Digitalization level and complexity

From the graph does not appear to be a correlation between digitalization, scale and complexity in fact most of the universities have a good level of digitalization despite their size and complexity are very different. Instead it appears to be a correlation between the level of digitalization and supply volumes within universities. As the graph below shows, in fact, the increase of the volume of supply also increases the level of digitization.

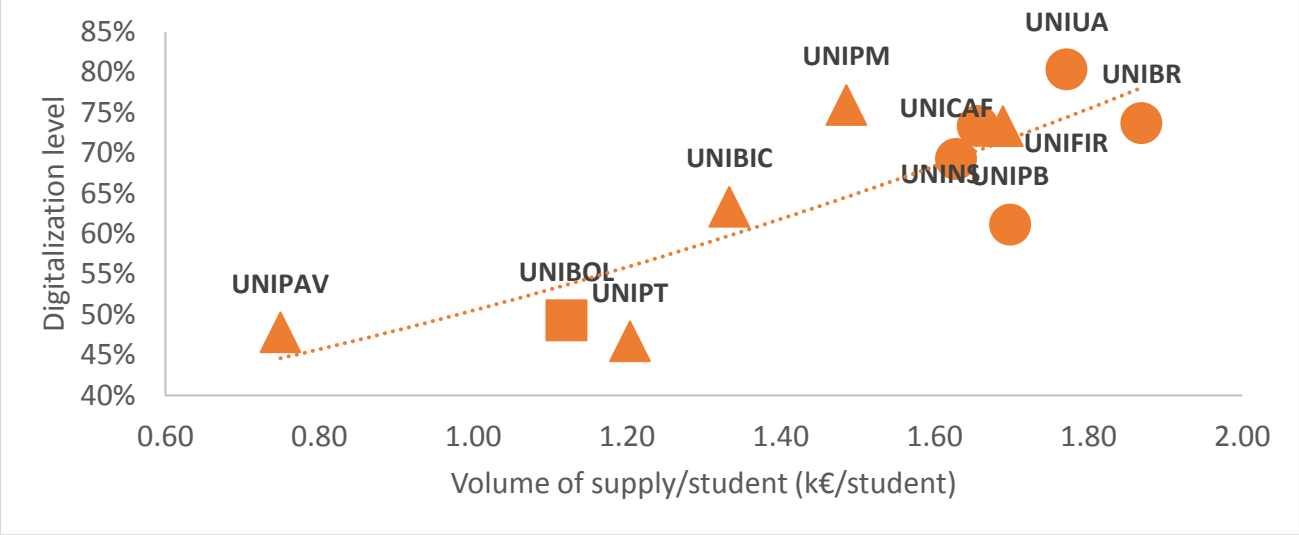


Figure 19 Correlation between Digitalization level and volume of supply

A similar correlation also exists between the degree of digitalization and the level of structuring of the process, the graph below shows that in fact the two indicators are directly proportional.

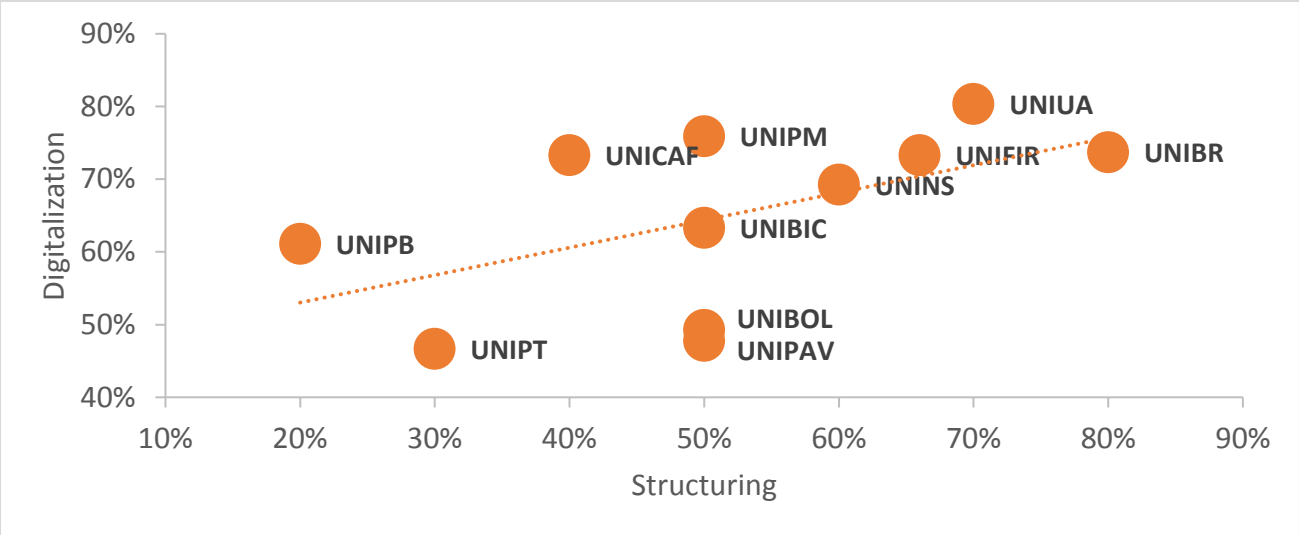


Figure 20 Correlation between Digitalization level and Structuring level of the process

6.2 Second research question " How to measure procurement performance in Italian universities?"

In this second part of the chapter we try to give an answer to the second research question. In particular, based on data obtained from the questionnaires and research on the sample universities, we analyze the impact of measures taken at the level of organizational structure and technological configuration of the procurement process performance within the Italian universities. So we try to understand whether the measures taken allow us to obtain the benefits suggested from the literature, as we saw in the second chapter. In this part, we use as support the third block of our analysis framework.

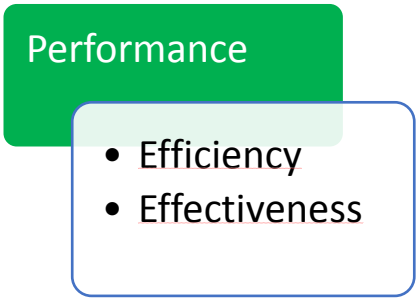


Figure 21 Third block of the framework

Beginning with the performance of the process in terms of efficiency, the performance is measured based on the unit cost of service, obtained from the ratio between the total cost of the process and the volume of supply. The chart below shows the unit costs incurred by the various universities.

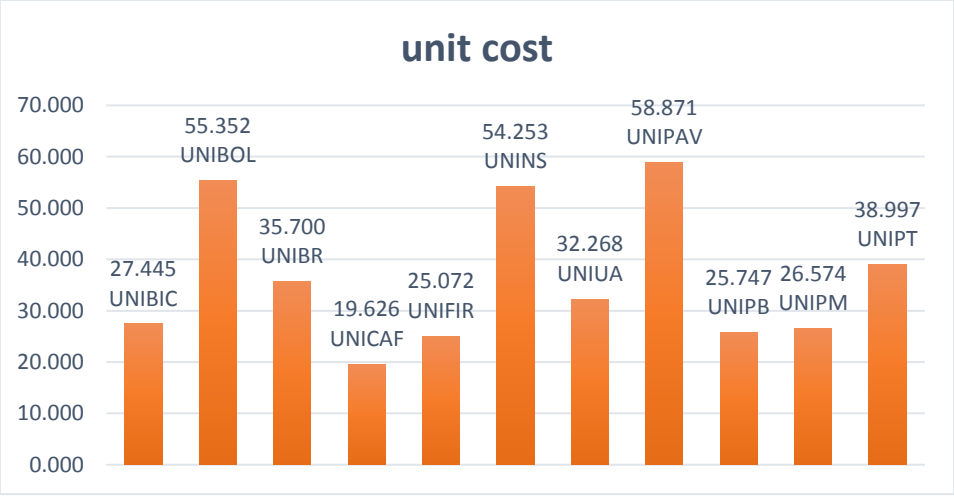


Figure 22 Unit cost of the purchasing service within the sample universities

With regard to the performance of the process in terms of effectiveness, this is measured according to the satisfaction of the university of the process performance.

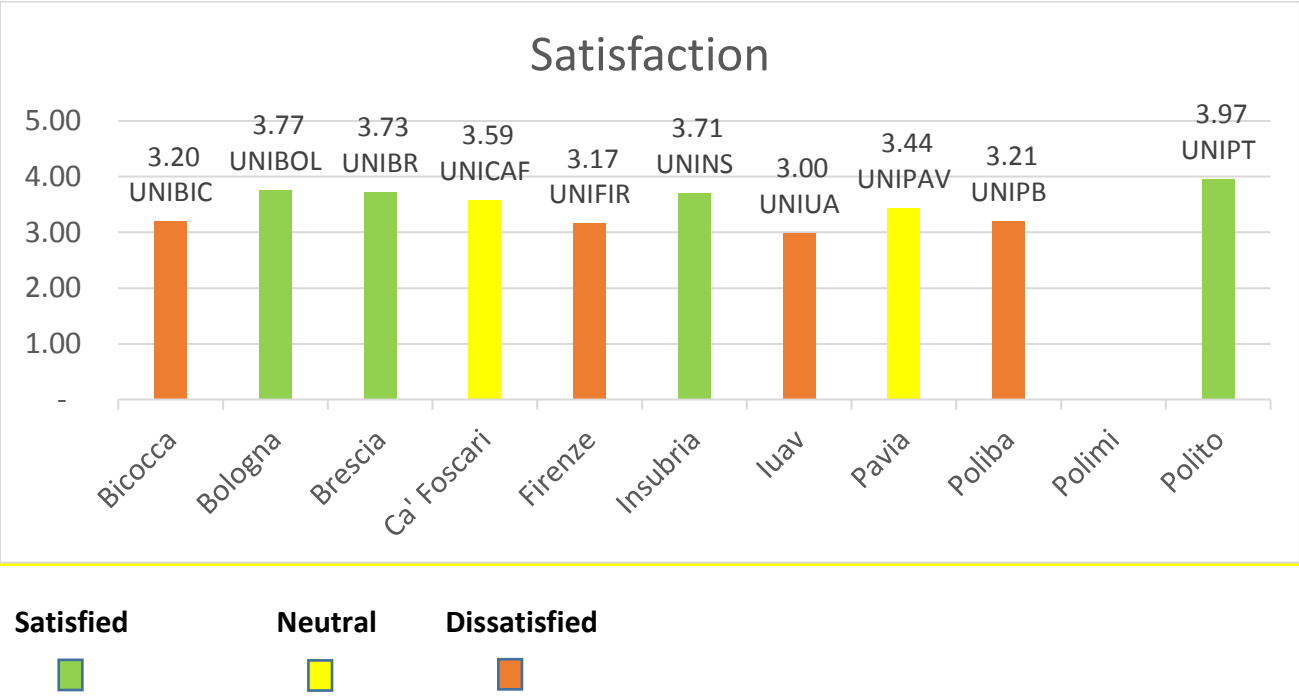


Figure 23 Level of satisfaction of the users

As shown from the chart the UNIBOL University, UNIBR, UNINS and UNIPT are satisfied with the performance. Those of Pavia and UNICAF are neutral, and the UNIBIC University, UNIFIR, UNIUA and UNIPB are dissatisfied of the performances. While for UNIPM, there are no data regarding the level of satisfaction.

Now we try to understand the impact of the various configuration of the buying process within universities on the cost of the process and user satisfaction. Starting from the level of **centralization** of purchases:

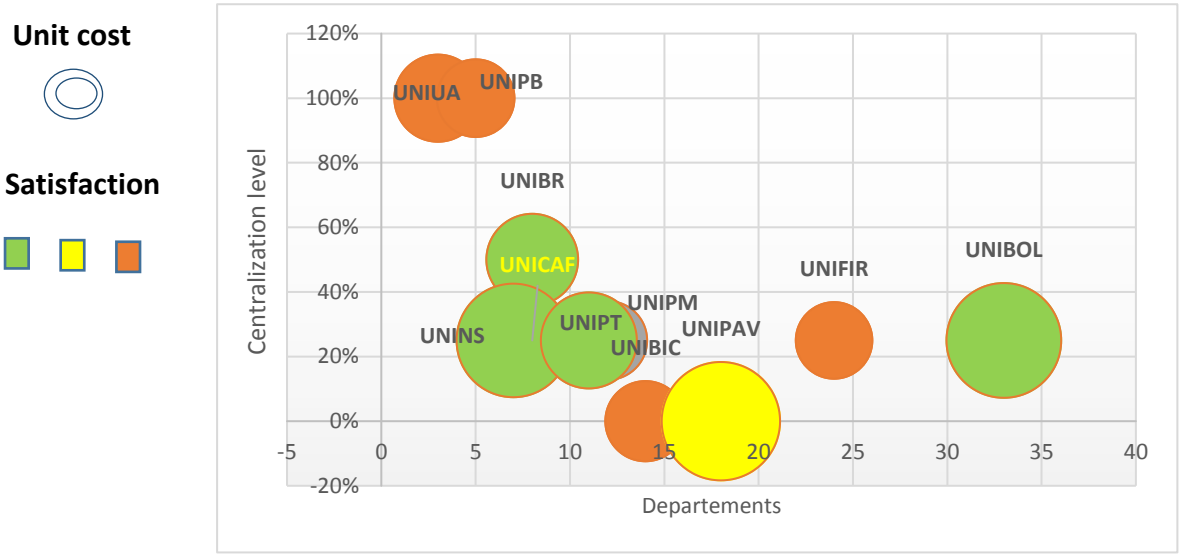


Figure 24 The impact of centralization on cost performance

The graph correlates the level of centralization to the performance of the process in terms of efficiency and effectiveness. The graph shows that the centralization of the process has a positive impact in terms of efficiency, in fact the two universities with a centralized process (UNIUA and UNIPB), have unit costs among the lowest and instead the highest unit costs are incurred by the three universities UNIPAV, UNINS and UNIBOL that have decentralized and hybrid structures.

With regard to the effectiveness of the process, evaluated as said before according to the users' satisfaction, it can be observed that the four universities that said they were pleased with the performance, have a hybrid structure of the process. While fully decentralized universities, UNIBIC and UNIPAV, are one unsatisfied and the other neutral, and those centralized UNIUA and UNIPB are dissatisfied with the process performance. Then, based on the data, a hybrid structure allows supply process to obtain more benefits in terms of effectiveness.

Now we deal with the other two measures taken by the universities, the digitalization and the structuring of the process, we try to understand their impact on process performance in terms of efficiency and effectiveness through their correlation with the unit cost and user satisfaction. The chart below shows this correlation.

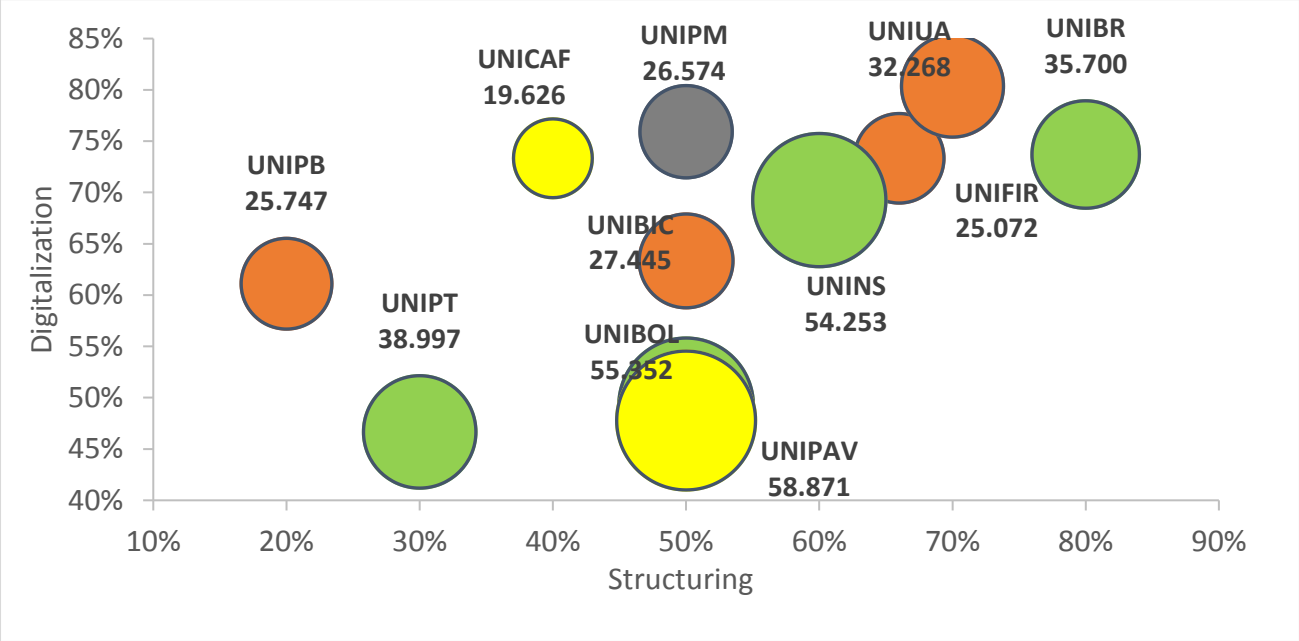


Figure 25 Impact of digitalization and structuring of the process on the process performance in terms of efficency and effectiveness

As regards the **digitalization** of the process, it results to have a strong correlation with the savings of the cost of the process, in fact the universities where the level of digitalization is high (UNIBIC, UNIPB, UNICAF, UNIFIR, UNIUA, UNIPM) have very low unit costs compared to the other, they have a level of digitalization over 70%, with exception of UNIBIC and UNIPB who have digitalization level between 60% and 70%. The universities instead with the highest unit costs of the sample (UNIPAV and UNIBOL), have a low level of digitalization, less than 50%. So the digitization of the procurement process within universities have a positive impact in terms of efficiency.

Instead from the survey data is not possible to obtain a particular correlation between digitalization and satisfaction, in fact the universities with high level of digitalization (UNIBR, UNIUA, UNIFIR, UNINS, UNICAF, UNIPM) are two satisfied, two dissatisfied and one neutral.

With regard to the **structuring**, the sample universities have adopted very structured procedures, only three of the eleven universities have a structuring level that is below the 50%. But it does not appear to be a correlation either positive or negative between the structuring level and the cost of the process. In fact, between universities, with the structuring of the process over the 50%, there are those with very low unit costs that exceed by little the 20,000 and those with the highest unit costs of the entire sample.

However there seems to be a positive correlation between structure and effectiveness of the process, in fact, three of the universities that be deemed as satisfied of the performances (UNIBOL, UNINS and UNIBR), have a structuring level of the buying process that exceeds 50%.

7 Conclusion

The aim of our study was to describe the procurement process of the Italian universities, identify its configurations and understand their impact on the process performance, based on this we formulated our two research questions. In this chapter we try to put together what we exposed in the process of discussion of the results in order to then give an answer to our questions. A second part of the chapter defines the contribution of the work to the theme of the procurement process in the Italian universities and are subsequently exposed limitations and possible future developments.

7.1 Answers to the research questions

Based on the discussion of the results carried out in the previous chapter we give the answers now, we have reached for the two research questions that we posed at the beginning of the work.

7.1.1 First answer: Which are the characteristics of the procurement process of Italian universities, and how its management is affected by the level of centralization, digitalization and formalization?

As said before, the characteristics of the procurement process are influenced by the surrounding context. So to be able to describe the process, must first be analyzed the context. Concerning the description of the context of the procurement process, we can conclude that contextual factors are related to each other. In particular, with the increase of the size of the university also increases its complexity, but decreases the supply cost per student sustained by the university. While for other contextual factors, given in paragraph 5.5 (geographical location, university age, type of disciplines) we can observe that for geographical and disciplines clusters there are no specific comments regarding the size, complexity and cost of procurement. With regard to clusters created based on the age of the university it can be noted that, old university (founded before 1900), have a greater size and complexity than younger universities and consequently also lower cost of procurement for student compared to young universities.

Regarding instead the description of the process in organizational and technological terms, we can conclude that the procurement process within universities with small size, low complexity and high volume of supply per student is highly centralized and vice versa. Regarding other contextual factors such as geographical location, age and type of disciplines, by which we have defined the university clusters (see paragraph 5.5), we can see that geographically: Northern universities have low level of

centralization while those of the south center are characterized by high centralization of the process, instead regarding the structuring of the process and digitalizing the two clusters have both medium - high levels. The same applies to the division according to age, the young universities are more centralized than older ones, while for the other two indicators both clusters have medium to high level of structuring and digitalization. Even for clusters of disciplines the technical-scientific universities are more centralized than humanistic -scientific, while for the other two indicators, is applied what has been said for the other clusters. This similarity between the level of the structuring and the level of digitalization of the process between all the universities clusters is due to the fact that all of the sample universities appear to have quite structured and digitalized process. In fact, from the analyzed data, it appears that all universities have a structured procurement process, which means that the procurement process has standardized and formalized procedures. Is therefore used a structured system for the detection of needs, it takes place a program of demand and a performance monitoring of suppliers once completed the supply operation. Also at the level of technological configuration of the process, the analysis shows that the Italian universities have a good level of usage of IT solutions regarding their purchases, regardless of contextual factors such as the size and complexity. In fact, from the responses of the various universities of the sample to our questions, appears to be a medium level of digitalization of the various stages of the supply process, instead a high percentage of purchases of the universities, is done through electronic procurement systems.

7.1.2 Second answer: How to measure procurement performance in Italian universities?

Our research measures the performance of the universities procurement process through the efficiency and effectiveness of the process, and try to understand the impact of the various configurations on the process performance. From our work, we came to the result that centralized organizations have a more efficient procurement process in terms of cost, compared to decentralized or hybrid organizations. This is in accordance with what the authors Thai (2001) and Albano and Russo (2009) claim. According to whom the main advantages of centralization is the Increase of the efficiency of the procedure and rationalization of the purchases, because with the aggregation of demand, and the high volumes, the supplier can exploit the advantage of economies of scale and scope, and thus obtain from the supplier a lower price for the product.

Another reason of the increase of the efficiency is that the centralization of the procurement process reduces the set of transaction costs that, can be saved through a drastic reduction of identical procedures and decentralized information gathering, preparation of tenders, selection of operators, monitoring and ex-post verification.

With regard to the effectiveness of the process, from our research appears that the hybrid structure of the procurement process is the one that allows to obtain the best performance. This is in agreement with the analysis of the literature we did, we have seen in fact, in the second chapter that lately there is a tendency in both the public sector and in private to adopt hybrid structures, because this allows enjoying the advantages of both centralization and decentralization (Thai 2001). Also Barbieri and Zanoni (2005), claim that the adoption of a hybrid structure, in which the purchasing of standard goods is centralized, and the management of specific purchases leaved to individual departments, is the solution of the specific case of universities. They therefore consider that in the case of universities which purchases are characterized by high specificity and therefore require specific skills from those who carry out the purchase process, the adoption of the hybrid structure will solve the trade-off between achieving the objective of efficiency and the satisfaction of the applicant.

With regard to the digitalization of the procurement process, and therefore the use of IT solutions for the management of the process and the use of e-procurement systems, in the literature it is claimed that it can increase the efficiency and the quality of the process in terms of process simplification and reduction of lead-times due to the management of all procedures by electronic means and, consequently, reduce the time of procedures (Vaidya, 2007). Also (Ronchi,2010) claim that the digitalization of the process allows cost reduction because the use of digital tools increase the visibility of expenditure and therefore allow a better control of costs and to identify waste and inefficiency. The results of our research are in accord with the literature regarding the reduction of the costs of the process, it has been seen that digitization has a positive impact on the efficiency of the process, while we did not have clear results about its impact on the effectiveness of the process of supply.

Regarding our third indicator, the structuring of the process, in literature is always seen as a complementary measure to centralization and digitization for the rationalization of the procurement process in terms of both cost savings and in terms of quality of the process.

The results obtained from the analysis allow us to confirm this point of view as regards the effectiveness of the process, instead there is currently not a particular impact on the efficiency of the process.

7.2 Contribution of the research to literature and the theme of universities procurement process

The subject of public procurement has been widely covered in the literature, but only a small number of recent studies have dealt with the case of the procurement process in the Italian universities. So our research contributes to the deepening of a topic still little discussed in public procurement literature. And while the research conducted focus their attention on the impact of organizational decisions on process performance, yet the literature has not delved into the impact of the university context variables on organizational and technological choices of the process as it happens in our research, At the level instead of the various organizational configurations, the research on university procurement process are increasingly focused on the analysis of centralization and digitalization of the process, neglecting a little the structuring of the process, our research seeks to deepen rather equally the three indicators giving equal relevance to the theme of structuring. In addition, the results of our research can be a starting point for good practices that can be applied to the university purchasing process, from those involved in its management and configuration.

7.3 Limits of the work and possible future developments

The work could present some limits and possible improvements, first of all, the sample used for our research consists of a small number of universities which are not distributed in conformity at geographical level, since the majority belongs to the northern Italy are also only Italian university, so we do not go to touch the European or international context. For this reason, the results obtained cannot be generalized for other contexts. The techniques used to conduct our research, are only the direct search of information and questionnaires, surely the use of other techniques such as direct interviews with individuals involved in the purchasing process within universities, and techniques for the analysis of the data statistics, could lead to more accurate and detailed results.

This work could be a starting point for work that has as its object a larger sample of universities, and more varied in terms of geographical distribution; which then allows the use of statistical techniques for data analysis and to obtain more precise results. Moreover, the same research could be

conducted on universities belonging to different contexts, the European context or international context, and then do a comparison with Italians universities.

In terms of work methodology, we could improve the analysis model, for example by treating other context variables in the analysis. Another suggestion would be to treat specific case studies, which therefore allow to go deeper into the information about the purchasing process, its configuration and performance.

Appendix

Questinnaire 1: Survey on procurement in the universities

The Research conducted by the Polytechnic of Milan, in collaboration with CINECA, intends to investigate what are the organizational and technological models with which the universities manage today the purchase process, with particular reference to actors, roles, decision-making mechanisms and instruments used, in order to identify the main critical issues, identify the benefits of the digitization process and the scan priority. We kindly ask you to fill out the following questionnaire in all its sections.

Some useful tips:

- You will access the next page only after answering all the questions on the page where you are located.
- The answers will be automatically saved.
- You will have the option to change your answers.

There is no dissemination of data processed except in aggregate and anonymous form.

For any need for clarification, let her also applies to:

Giulia Marchio

Email: giulia.marchio@polimi.it

Phone: +39 02.2399.4851

Thank you for your valuable contribution.

1. Give the full name of the University at which you operate.
2. In which region is located your University.
3. Indicate your role within the University.
4. Indicate the number of (making reference to the year 2014):

   Departments:

   Students:

   Projects:

   Locations:

   Teachers:

5. Enter the name of the accounting software used by the University:
6. Respect to the total for the purchased goods, services and works, indicate:

   Total expenditure:

   Number of suppliers:

   Number of orders:

7. With reference to possible improvements of the University purchasing processes, indicate what are the priorities on a scale of 1 to 6, where 6 = very priority and non-priority = 1

	1	**2**	**3**	**4**	**5**	**6**
Reduce the cost of the purchase process						
Reduce the purchase price						
Rationalize demand						
Reduce demand						
Rationalize the supplier base						
Reduce the number of suppliers						
Improve the relationship and collaboration with suppliers						
Increase skills, of buyers						
Centralize the procurement function						
Outsource non-strategic purchases						
Increase the quality of purchases						

8. Which are in your opinion the major risks associated with the procurement process in your University?
   - price variance (volatility)
   - quality problems
   - Delivery problems
   - Sustainability of the buying process
   - buyers' skills
   - supplier's reliability
   - Variability of goods and services purchased
   - Other (specify)

9. With reference the risks illustrated, which risk mitigation strategies could be taken?
    - supplier qualification
    - Evaluation of suppliers
    - Spend analysis
    - structured survey of needs
    - requirements planning
    - Computerization of the buying process
    - Use of central external client
    - Other (specify)
10. What is the level of standardization in the purchasing procedures management in your University?
    - Very low (no procedure, it is decided case by case)
    - Low (there are few formal procedures)
    - Medium (existence of a number of formal procedures)
    - High (most of the procedures are formalized)
    - Very high (degree of formalization and high standardization for all procedures)
11. Within your university, your purchases are managed:
    - All centrally
    - All autonomously
    - In part by the Central and partly by the individual with a defined distribution of goods / services
    - In part by the Central and partly by the individual without a defined subdivision of goods / services
12. In your university, there is an office dedicated to the management of purchases?
    - Yes, there is a central office dedicated to the management of all the University's purchases
    - Yes, both the Central Administration that each Department have offices dedicated to purchasing management
    - Yes, in the Administration Center it is a Purchasing Department, while in the Departments are not always present a structured office
    - No, there is not a purchasing office and each department and each department manages independently purchases

13. With regard to purchasing procedures managed by the Departments, which actors are involved in the different stages of the process?

	Analysis of purchase and applications needs	Definition of specifications and functionality	Choice of custody procedure	supplier search	Definition of tender specifications	the tendering stage management	Analysis of the purchasing process performance	administrative management of the contract	Operational Contract Management
individual users who will use the goods / services acquired									
manager of the fund teacher									
Department Secretary									
Department director									
General manager									
Office of Purchasing department									
Central Office of University Purchasing									
Office with legal / regulatory powers									
Office with specific expertise on the acquired asset									

14. With regard to purchasing procedures managed by the Central Administration, which actors are involved in the different stages of the process?

	Analysis of purchase and applications needs	Definition of specifications and functionality	Choice of custody procedure	supplier search	Definition of tender specifications	the tendering stage management	Analysis of the purchasing process performance	administrative management of the contract	Operational Contract Management
individual users who will use the goods / services acquired									
manager of the fund teacher									
Department Secretary									
Department director									
General manager									
Office of Purchasing department									
Central Office of University Purchasing									
Office with legal / regulatory powers									
Office with specific expertise on the acquired asset									
Responsible Office / Service Heads									
Heads Area / Sector									

15. With reference to the phases of the purchase process for which the previous question was indicated "No, and we do not think to implement it", what are the reasons?

	Yes and it it is adopted by the entire universityuse the goods / services acquired	Yes but it is used only by some Directorates / Departments	Under implementation / testing	No, but we are evaluating the implementation	No, and we do not think to implement it
Analysis of purchase and applications needs					
Definition of specifications and functionality					
Choice of custody procedure					
supplier search					
Definition of tender specifications					
the tendering stage management					
Analysis of the purchasing process performance					
administrative management of the contract					
Operational Contract Management					

16. With reference to the purchasing process steps for which the question previous was designated "No, and we do not think to implement it", what are the reasons?

	Not applicable	The digitization of this phase would not bring significant benefits	Lack of adequate financial resources	quality and competence of supplier's poor	Limited availability of staff to be dedicated	Lack of skills	It is not a priority of Leadership
Analysis of purchase and application s needs							
Definition of specificatio ns and functionali ty							
Choice of custody procedure							
supplier search							
Definition of tender specificatio ns							
the tendering stage manageme nt							
Analysis of the purchasing process performan ce							
administra tive manageme nt of the contract							
Operationa l Contract Manageme nt							

17. There is a structured system, even non-computerized, for the detection of needs?
    - Yes, to all types of goods / services purchased
    - Yes, for most of the types of goods / services purchased
    - Yes, for some types of goods / services purchased
    - No
18. You make a program of requirements (at least for a product category)?
    - Monthly
    - Quarterly
    - four-monthly
    - half-yearly
    - Annual
    - No
19. At the end of the buying process, it is carried out a structured assessment of the supplier's level of service?
    - Yes, for all purchases
    - Yes, but only for certain purchases
    - No
20. Which measures of performance of the purchasing process your University use?
    - They are not recognized performance
    - Indicators related to time and / or cost of managing the purchasing process
    - economic indicators of spending analysis
    - satisfaction indicators on the provision as a whole
    - Indicators of internal user satisfaction on the buying process management
    - Other (specify)
21. Which activities of the buying process is more critical and / or expensive? (select maximum 3 options)
    - Analysis of purchasing needs and applications
    - Defining features of the solution to buy
    - Definition of tender specifications
    - of possible suppliers' search
    - Assess ex ante the reliability and the level of service of a supplier

- Mode selection for placement of the delivery service
- the tendering stage management
- administrative management of the contract
- Operational Contract Management

22. In your opinion what are the areas on which it would be necessary to increase the skills of the University?
    - Analysis of purchasing needs and applications
    - Defining features of the solution to buy
    - Definition of tender specifications
    - of possible supplier's search
    - Assess ex ante the reliability and the level of service of a supplier
    - Mode selection for placement of the delivery service
    - the tendering stage management
    - administrative management of the contract
    - Operational Contract Management
    - Nothing
23. Indicate how much you agree with the following statements on a scale of 1 to on the management of the purchasing process on a centralized campus.

	1	2	3	4	5	6
It generates savings for the University in terms of PRICE REDUCTION OF SUPPLIES						
It generates savings for the University in terms of REDUCTION OF THE DURATION OF THE PURCHASE PROCESS						
It generates savings for the University in terms of INCREASED AVAILABILITY OF						
PERSONNEL						
It generates an INCREASE THE QUALITY of delivery						
It is necessary because the successful management of the purchasing process requires SKILLS SPECIALIZED that individual departments do not generally possess						
It generates NEGATIVE EFFECTS related to loss of control						

24. Indicate how much you agree with the following statements on a scale of 1 to 6 on the management of the buying process through a shared central purchasing body between different universities.

	1	2	3	4	5	6
It generates savings for the University in terms of PRICE REDUCTION OF SUPPLIES						
It generates savings for the University in terms of REDUCTION OF THE DURATION OF THE PURCHASE PROCESS						
It generates savings for the University in terms of INCREASED AVAILABILITY OF						
PERSONNEL						
It generates an INCREASE THE QUALITY of delivery						
It is necessary because the successful management of the purchasing process requires SKILLS SPECIALIZED that individual departments do not generally possess						
It generates NEGATIVE EFFECTS related to loss of control						
It generates NEGATIVE EFFECTS related to exclusion of non-registered suppliers to the central purchasing						

25. Your university, publish on its website data on its spending? (If you answer Yes go to question 27)
    - Yes, in the standard XML planned route by ANAC
    - Yes, in the standard XML layout and other processable format (csv, excel)
    - Yes, information is published in other non-standard formats
    - No
26. Why your university has not posted on its website data on spending?
    - we do not have the information required for publication
    - The publication of data is too costly in terms of time
    - The publication of the data is too costly in economic terms
    - We have the skills to produce this information
    - Other (specify)
27. Have you ever used electronic platforms to make purchases of goods or services for your university? (If you answer yes go to question 29)
    - Yes
    - No

28. Why you have not purchased via electronic platforms?

- We do not possess the computer skills to use electronic platforms
- The platforms available today are too complex to be used
- We tried to use the platforms but without finding the products or services we needed
- We tried to use it but the platform had technical problems that made it unusable
- We could not find on the electronic platform vendors tailored to the needs
- We never used electronic platforms but we are working to use them in future purchases
- It not yet has been integrated into the municipal regulation of the use of the platform requirement
- Other (specify)

29. What percentage of the total number of purchases are made on electronic platforms?

- No purchase
- 1% 25% of purchases
- 26% 50% of purchases
- 51% 75% of purchases
- Over 75% of purchases

30. What kind of tool you use?

- Consip conventions
- Framework agreements Consip
- Electronic Market of the Public Administration (MEPA)
- dynamic system of purchase of the Public Administration (SDAPA)
- regional platform
- Other purchasing platforms (please specify)

31. Indicate how much you agree with the following statements on a scale of 1 to 6 on the use of electronic platforms.

	1	2	3	4	5	6
It is difficult to identify in advance the quality and the service provider level						
It is difficult to search for the product / service						
It is difficult to understand which platform-specific use of the different options offered at national, regional, etc.						
It is difficult to adapt the organizational processes of the former state of the electronic platform management rules						
It requested to adjust the Entity regulations to the rules of the electronic platform						
I found numerous inefficiencies of the platforms used						
I found that the lack of adequate support in the use (help desk, service)						
I could choose between a small number of providers available than the actual market supply						
I faced difficulties in being able to compare between them the available offers						
I found that the platform capabilities were inadequate for the purchase of products or services I need						
I found that the inadequacy of methods of classification of products and services						
I have found a worse quality of delivery						
I have seen an increase in the purchase cost of supplies						
I have noticed an increase in the purchasing process management costs						
I found an increase of the times of the internal procedures of custody management						
I found that the simplification of procurement procedures						
I found a greater possibility of entrusting direct assignments with values above the thresholds						
I found a greater transparency in tendering procedures						

Questionnaire 2: Survey on procurement in the universities – Insights

1. Give the full name of the University at which you operate.
2. Within your university, your purchases are managed:
    - All centrally
    - All autonomously
    - In part by the Central and partly by individual departments with a defined subdivision of goods / services, depending on the product group
    - In part to the Central Administration, and partly by the individual departments with a defined subdivision of goods / services, depending on the economic value of purchase
    - In part by the Central and partly by individual departments without a defined subdivision

3. Within the Departments of your University is present, an office / a function dedicated to the management of purchases?
    - In all departments there is an office dedicated to the management of all the University's purchases
    - In some departments there is a dedicated office, while in others there is a contact person to turn to for the management of procurement procedures
    - In the departments it is not a contact person, and users shall independently to make the purchases
    - Purchases of Departments are managed by the Central Administration

4. With reference to the purchasing process steps for which it is not present an information solution to support activities, indicates the motivation.

Operational Contract Management							
administrative management of the contract							
Analysis of the purchasing process performance							
the tendering stage management							
Definition of tender specifications							
supplier search							
Choice of custody procedure							
Definition of specifications and functionality							
Analysis of purchasing needs							
	The stage is supported by an information solution	The stage is not supported by an information solution, but we are assessing the implementation	The stage is not supported by an information solution and we do not think to implement it because the digitization of this phase would not bring significant benefits	The stage is not supported by unasoluzione information and we do not think to implement it for lack of adequate financial resources	The stage is not supported by an information solution and we do not think to implement it due to lack of quality and competence of suppliers	The stage is not supported by an information solution and we do not think of	implement it for lack of available staff to devote

5. How do you make the programming of needs?

    - Analytically, based on historical data
    - Analytically on the basis of the future purchase forecasts
    - In aggregate mode, without a detail of the purchase requirement, on the basis of historical data
    - In aggregate mode, without a detail of the purchase requirement, on the basis of the forecast future purchase
    - Not one of the requirements planning is carried out

6. What percentage of the total number of purchases are made on electronic platforms?

	Compared to total spending compared to the total purchase transactions	Compared to total spending compared to the total purchase transactions
No purchase		
1% -25% of purchases		
26% -50% of purchases		
51% -75% of purchases		

7. Which activity of the buying process is more critical, that require specialist / technical skills?

    - Analysis of purchasing needs and applications
    - Defining features of the solution to buy
    - Definition of tender specifications
    - of possible suppliers' search
    - Assess ex ante the reliability and the level of service of a supplier
    - Mode selection for placement of the delivery service
    - the tendering stage management
    - administrative management of the contract
    - Operational Contract Management

8. Which activity of the buying process is more expensive, which requires particularly relevant use of staff time, for its carrying out?

    - Analysis of purchasing needs and applications
    - Defining features of the solution to buy
    - Definition of tender specifications
    - of possible suppliers' search

- Assess ex ante the reliability and the level of service of a supplier
- Mode selection for placement of the delivery service
- the tendering stage management
- administrative management of the contract
- Operational Contract Management

9. Respect to the type of specified goods / services, please indicate how much you agree with the following statements about the centralized management of the purchasing process

	specialized services (eg. specialist advice)	standard services (eg. telephone / Utility)	specialized goods (eg. specialized equipment)	standard goods (eg. consumable)
It generates savings for the University in terms of REDUCTION OF PRICES SUPPLIES				
It generates savings for the University in terms of REDUCTION OF THE DURATION BUYING PROCESS				
It generates savings for the University in terms of INCREASED AVAILABILITY OF PERSONNEL				
It generates a QUALITY AUMENTODE LLA the supply				
It is necessary because the successful management of the purchasing process requires SKILLS SPECIALIZED that individual departments do not generally possess				
It generates NEGATIVE EFFECTS related to loss of control				
It generates ADVERSE EFFECTS related to the increased processing time of purchase requests				

10. Respect to the type of specified goods / services, please indicate how much you agree with the following statements about the management of the buying process through a central purchasing body shared among multiple universities.
    For the answer it is used a table same as the question 9.
11. Indicate how much you agree with the following statements on the use of the Electronic Market (or comparable tools) to purchase indicated goods / services.

	standard goods (eg. consumable)	specialized goods (eg. specialized equipment)	standard services (eg. telephone / Utility)	specialized services (eg. specialist advice)
It is difficult to identify in advance the quality and the service provider level				
It is difficult to search for the product / service				
It is difficult to understand which platform-specific use of the different options				
offers national, regional, etc.				
It is difficult to adapt the organizational processes of the former state of the electronic platform management rules				
It requested to adjust the Entity regulations to the rules of the electronic platform				
I found numerous inefficiencies of the platforms used				
I found that the lack of adequate support in the use (help desk, service)				
I could choose between a small number of providers available than the actual market supply				
I faced difficulties in being able to compare between them the available offers				
I found that the platform capabilities were inadequate for the purchase of products or services I need				
I found that the inadequacy of methods of classification of products and services				
I have found a worse quality of delivery				
I have seen an increase in the purchase cost of supplies				
I have noticed an increase in the purchasing process management costs				
I found an increase of the times of the internal procedures of custody management				
I found a simplification of procurement procedures				
I found a greater possibility of entrusting direct assignments with values above the thresholds				
I found a greater transparency in tendering procedures				

12. Indicate how much you agree with the following statements on use of conventions (or comparable tools) for the purchase of goods / services.

	standard goods (eg. consumable)	specialized goods (eg. specialized equipment)	standard services (eg. telephone / Utility)	specialized services (eg. specialist advice)
It is difficult to identify in advance the quality and the service provider level				
It is difficult to search for the product / service				
It is difficult to understand which platform-specific use of the different options offers national, regional, etc.				
It is difficult to adapt the organizational processes of the former state of the electronic platform management rules				
It requested to adjust the Entity regulations to the rules of the electronic platform				
I found numerous inefficiencies of the platforms used				
I found that the lack of adequate support in the use (help desk, service)				
I could choose between a small number of providers available than the actual market supply				
I faced difficulties in being able to compare between them the available offers				
I found that the platform capabilities were inadequate for the purchase of products or services I need				
I found that the inadequacy of methods of classification of products and services				
I have found a worse quality of delivery				
I have seen an increase in the purchase cost of supplies				
I have noticed an increase in the purchasing process management costs				
I found an increase of the times of the internal procedures of custody management				
I found a simplification of procurement procedures				
I found a greater possibility of entrusting direct assignments with values above the thresholds				
I found a greater transparency in tendering procedures				

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