JOURNAL OF PUBLIC PROCUREMENT, VOLUME 6, ISSUES 1 & 3, 46-69 2006

THE IMPLEMENTATION OF AN E-REVERSE AUCTION SYSTEM IN AN ITALIAN HEALTH CARE ORGANIZATION[1]

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ABSTRACT. E-Procurement (EP) can be defined as using the Internet in the purchasing process (de Boer, Harink & Heijboer, 2002). This paper focuses on the EP implementation process. Such process is defined as the way new technologies are absorbed by organizations and become part of their routines (Capaldo, Raffa & Zollo, 1994; Leonard-Barton, 1988; Leonard & Spring, 2002). This paper illustrates the preliminary results of an explorative study focused on the implementation process of an e-procurement system in the Italian-public-health-care system. Drawing on the ICT implementation process literature, this research aims at contributing to the identification of a set of conditions under which different EP forms appear appropriate in different purchasing and organizational settings (Min & Galle, 1999; Emiliani, 2000).

INTRODUCTION

Today, organizations find themselves facing rapid series of market shifts, new technological innovations, and changes in government policies (Eisenhardt & Brown, 1999). The mirror image of such phenomena is an increasingly turbulent environment that firms have to deal with (Haeckel & Nolan, 1993; Bradley & Nolan, 1998). As a consequence, successful organizations are those that have learned how to

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be innovative and creative without resorting to the level of discipline that is instrumental in effectively executing plans. In order to do so, it is necessary to modify firms' organizational designs, taking advantage of information and communication technologies (ICT). ICT is a critical enabler of the redefinition of each organization. It lays the ground for the redistribution of power, functions, and control wherever they are most effective, given the mission and objectives of the organization and the culture it enjoys (Morton, 1991). This is true for private companies as well as for state-run firms. As regard to the latter category, over the past decade such firms have experienced a radical change in the environment they operate in. On the one hand, major cuts in government-budgets have reduced financial resources that state-run companies can rely on. On the other, it has been considered increasingly important to provide citizens with high-quality services. In order to deal with such challenges, governments have tried to benefit from the exploitation of ICT solutions. In doing so, they have started implementing e-government policies (Lenk & Traunmuller, 2000; Sprecher, 2000; Devadoss, Pan & Huang, 2002).

This paper analyses a particular aspect of e-government. It focuses on e-procurement (EP) in the Italian health care system. More specifically, this is the first step of an explorative study aimed at analysing the implementation process of EP systems in the public sector. The starting points of this research are both a theoretical framework and a descriptive scheme that refer to the implementation process of ICT technologies. Both are utilized in order to analyse an e-reverse auction system implemented by a public-health-care institution – the Rizzoli Orthopaedic Institute – based in Bologna (Italy). The bottom line is to verify if the key features of the ICT implementation process may help identify which EP form appear appropriate to a specific purchasing and organizational setting.

The paper will provide an overview of the EP literature. Besides EP definitions, the overview illustrates EP tools and different approaches adopted in order to analyse e-procurement. It will explore the changes in the Italian public sector. These changes laid the foundation for e-procurement systems to be adopted and implemented by public firms. Then, the key characteristics of the implementation process of ICT will be illustrated; methodological aspects are taken into account; and both the results of the field analysis and the findings of this research will be presented.

E-PROCUREMENT: DIFFERENT TOOLS AND APPROACHES

To begin with, this paragraph presents an overview of the literature aimed at identifying both the most common definitions of e-procurement and the different tools EP refers to. Subsequently, different approaches dealing with e-procurement will be illustrated. Finally, the tool this paper focuses on, i.e. an e-reverse auctioning system, and the approach adopted in order to analyse it will be taken into account.

According to de Boer, Harink and Heijboer (2002), EP can be defined as using the Internet in the purchasing process. This definition includes intranet as well as extranet applications. Similarly, Presutti (2003) defines EP as a "technology solution" that facilitates corporate buying using the Internet." Knudsen (2003) emphasizes the capability of electronic commerce to enhance the procurement process. According to Allen (2003, p. 357), "the legitimisation of EP has resulted from its ability to reduce transaction costs. But indeed e-procurement is far more than transaction costs [...]". In fact, e-procurement has the power to transform the purchasing process because it pervades all the steps identified in this process (Presutti, 2003).

Differences in the EP literature also refer to the variety of perspectives authors have taken advantage of in order to analyse this research field. To begin with, de Boer, Harink and Heijboer (2002) focus on both direct and indirect impacts of different EP systems on purchasing costs. Leonard and Spring (2002) draws on the transaction-cost literature (Williamson, 1979). More specifically, they look at EP through the lenses of the portfolio model of strategic purchasing (Kraljic, 1983). Esposito, Bruno, Mastroianni and Vellutino (2003) evaluate the cost/benefit ratio that influences the EP adoption of public-sector managers. In order to do so, they take advantage of two different typologies of indicators: technological/computer mediated communication indicators and organizational management ones. Furthermore, many authors focus on the ICT capability to facilitate the acquisition of goods. Others (de Boer, Harink & Heijboer, 2002) dig into the variety of tools that the "EP-label" may encompass. More specifically, it is possible to identify the following tools:

- *E-MRO*. It refers to the process of creating and approving purchasing requisitions, placing purchase orders and receiving goods and services by using a software system based on the Internet.

- *Web-based ERP*. The only difference between E-MRO and Web-based ERP is related to the fact that the former refers to non-product related goods, while the later deals with product related goods.
- *E-sourcing*. It refers to the process of identifying new suppliers for a specific category of purchasing requirements using Internet-based technologies.
- *E-tendering*. It refers to the process of sending requests for information and prices to suppliers and receiving the responses of suppliers using the Internet. It does not include closing the deal with the supplier.
- *E-reverse auctioning*. It enables a purchaser to buy goods and services needed from a number of known or unknown suppliers.
- *E-informing*. It refers to the process of gathering and distributing purchasing information. It is not associated with a step in the basic purchasing cycle.

As regards to different EP tools, this paper focuses on E-reverse auctioning. As already mentioned above, such a tool makes it possible for a purchaser to buy goods and services needed from a number of known and unknown suppliers. A reverse auction is a buyer-initiated auction in which a buyer asks for bids from multiple sellers; the price then decreases as sellers compete for the buyer's business with the lowest bid considered the winner. Usually, E-reverse auctioning focuses on the price of goods and services auctioned (Teich, Wallenius & Wallenius, 1999).

Figure 1 shows the flow of activity a buyer goes through along the reverse-auction process. The first three blocks illustrate the definition of the requirements that are used by a buyer in order to run a pre-qualification phase. This phase ends by choosing a restricted number of selected suppliers that will be entitled to participate in the e-reverse auction as bidders.

Figure 2 describes the auction process in the Italian public health care system. The process starts with defining both the items and the rules that will be followed during the bidding. Usually, the price is the key determinant for awarding the contract. Alternatively, the auction may take advantage of multiple criteria (Bichler, 2000).

FIGURE 1
Buyer's Flow of Activities in a Reverse-Auction Process

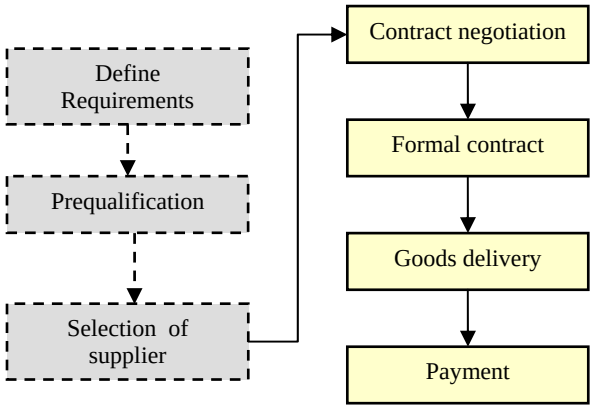
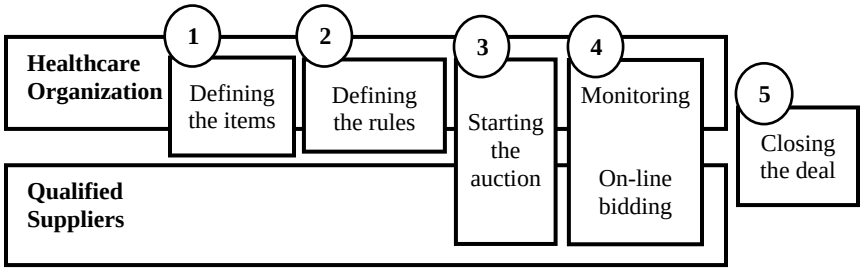


FIGURE 2
E-Reverse Auctioning Process



After closing the deal the buyer and the selected supplier have to negotiate the contract. This phase can be shortened if the pre-qualification phase and the definition of the items are accurate. The final steps are those related to the delivery of the goods and the payment.

This paper takes advantage of an internal-organizational perspective. More specifically, as EP is based on information and communication technologies, this study takes advantage of both the literature and a descriptive scheme that analyse the implementation process of such technologies. Our aim is to contribute to the identification of a set of conditions under which different EP forms appear appropriate in

different purchasing and organizational settings (Min & Galle, 1999; Emiliani, 2000).

E-PROCUREMENT IN THE PUBLIC SECTOR: THE ITALIAN SCENARIO

The EP-implementation process this paper focuses on is analysed taking into account an internal organizational perspective. However, it is important to describe the key features of the so-called external environment. In fact, e-procurement systems are not "isolated technologies". In other words, besides internal organizational variables, the implementation of such systems has to deal with external-environmental ones. As regards to the public sector, such variables refer primarily to the legal framework. In fact, such framework represents the engine, the main target and, at the same time, the potential obstacle of every e-government project (e-procurement in the public sector may be considered a building block of e-government). According to Strejcek and Theil (2002), the biggest threat to the successful implementation of such projects is represented by unsuitable legal environments. There is a huge variety of projects promoting e-procurement in the public sector (the OGCbuying.solutions Electronic Reverse Auctions Framework in the UK; www.FedBid.com in the US; the SECONDAM project in Mexico, the DAE in Chile, the CONSUCODE in Peru, etc.). However, as legal environments differ enormously from country to country, we decided to focus our analysis on the Italian legal framework. In fact the evolution of such environment made it possible for the e-procurement system presented below to be adopted and implemented by the Rizzoli Orthopaedic Institute. Subsequently, the analysis of external factors will be completed by taking into account industry related factors.

In 1999, the Italian government started changing its legal framework in order to encourage the adoption of e-procurement systems in the public sector. More specifically, this strategy was aimed at decreasing public expenditure (Allen, 2003) and rationalizing procurement processes through the adoption of ICT (Parker & Lawes, 2003).

To begin with, the Italian government concentrated in the hands of a state-led agency (CONSIP) the power of negotiating big contracts aimed at buying standard goods. In order to know the details of such contracts and the availability of goods, firms operating in the public sector have to surf CONSIP's electronic catalogues. In the footstep of such initiative,

CONSIP has tried to boost e-procurement taking advantage of both e-market places and e-auction tools. To facilitate the adoption of such innovative tools, CONSIP has chosen two sectors that had to take the lead in promoting new e-procurement initiatives. These sectors are the public health care system and the undergraduate/graduate public education sector (De Filippi & Pennisi, 2002). This paper focuses on the former. In order to promote e-procurement in the Italian public health care system, CONSIP has implemented a four-step strategy:

- To analyse the demand for both direct and indirect goods (both qualitative and quantitative aspects were taken into account).
- To promote e-procurement through initiatives such as conferences, magazines, newsletters, etc.
- To create a network of regional-based account managers who are in charge of identifying the real needs of public health care firms.
- To encourage the implementation of vertical projects. Such projects have to be realized through the cooperation of different public health-care actors.

Table 1 presents some figures illustrating the diffusion of e-procurement practices in the Italian public health care sector. Despite the high number of institutions that participate in the CONSIP system, the number of public health care companies that take full advantage of e-procurement systems is still low. In this respect the Rizzoli Orthopaedic Institute is one of the leading institutions in the implementation of e-

TABLE 1
E-procurement in the Italian Health Care System

Italian Healthcare Institutions	321
Italian Healthcare Institution participating in the CONSIP system	312
% of Healthcare Institutions participating in the CONSIP system *CONSIP*	*97%*
Registered users	1196
% on-line registrations	*60%*
% off-line registrations	*40%*
Approved Buyers	750
% on-line	*9%*
% off-line	*91%*

Source: CONSIP (2003).

procurement related strategies. More specifically, this Institute, together with the Hospital of Viterbo, has developed an e-auction platform aimed at buying both direct and indirect goods that cost less than 250.000 Euro. The project is aimed at purchasing goods that cost more than 250.000 Euro as well. But in this case the legal framework is still too complex. Therefore it puts a serious constraint on the development of the project.

Finally, as regards to industry-related factors, according to Arbin (2002) such factors can influence the implementation of e-procurement because of two main reasons: the scarcity/cost of assets required in order to benefit from ICT and the lack of standardization. With respect to the Rizzoli Institute, the adoption of a web-based system made it possible to minimize the assets required to benefit from ICT. In fact, suppliers were not asked to invest in any additional hardware/software component. More specifically, the preconditions to access the e-reverse auction platform are an Internet connection and a commonly-used web browser, such as Microsoft Explorer. Moreover, the Rizzoli Orthopaedic Institute dealt with the lack of standardization, choosing a Java-based software. In doing so, it managed to reduce the negative impact of software compatibility-related problems.

THE IMPLEMENTATION PROCESS OF INFORMATION AND COMMUNICATION TECHNOLOGIES

First of all, this paragraph illustrates the theoretical framework used by the authors in order to analyse the ICT implementation process. Once adopted, a new technology has to be implemented. In other words, it has to be absorbed by the organization that is involved in the implementation process (Orlikowski & Gash, 1994). This makes it possible for the new technology to become part of the routines of the adopting organization. According to this view, there are two key variables that characterize the implementation process: the organization involved in such process and the technology being implemented. Therefore, implementing a new technology means intervening on both aspects. However, according to the theoretical framework this paper takes advantage of (Berger & Luckmann, 1966; Capaldo, Raffa & Zollo, 1994; Leonard-Barton, 1988; Orlikowski & Gash, 1994, Capaldo, Esposito, Passiante & Raffa, 2004), to intervene on the technological and the organizational dimension is not a process that adheres to pre-determined rules. Rather, the social-constructionist theory (Berger & Luckmann, 1966) states that to develop and implement a new technology is a contingent process that involves

different factors. Therefore, technological changes can not be analysed through a fixed, unidirectional path. Rather, in order to explain such changes it is necessary to look at a number of technological controversies and difficulties that emerge randomly throughout the implementation process.

Although it is not possible to determine in advance the evolution path of the ICT implementation process, the theoretical framework mentioned above lays the ground work for the identification of the phases that characterize such process. In the first phase, either external or internal drivers may push a firm towards adopting new ITCs. In some cases such distinction may be blurring. However, internal drivers are made up by perceived opportunities (Majchrzack & Salzman, 1989; Tiwana, 2000), perceived organisational problems (Weick, 1995), and change-needs related to the implementation of a new ICT gizmo or to the upgrading of antiquated information systems (Leonard-Barton, 1988; Capaldo, Raffa & Zollo, 1994). On the contrary, external drivers are related to actors operating beyond the boundaries of a specific firm. In other words, not only does this category refer to clients, suppliers, competitors. But it also deals with regulators that modify operating standards, governments that change legal frameworks, etc.

In the second phase, the actual implementation process starts. At the very beginning, the new technology and the organization implementing it are not aligned. In regards to internal organizational aspects, there are two factors that play a key role in causing such misalignment: management expectations and the so called technological frames.

Management expectations. The choice to invest in new technologies is heavily influenced by management-expectations. Such expectations could span different fields: opportunities related to the improvement of some specific processes (Majchrzack & Salzman, 1989; Tiwana, 2000) such as procurement and sourcing, the change in the supply-network strategies (Harland, 1996), etc. Such expectations have to be transferred to both technology experts and end-users. However, despite their power, managers can not force these organizational actors to share their expectations (Harrison & Laberge, 2002). Moreover, such expectations may be beyond the reach of the technology and may not be in line with the absorptive capacity of the organization adopting it. These phenomena create a misalignment between the technology and the organization implementing it.

Technological frames. The way organizational actors describe a new technology is not given. Rather, it is influenced by technological-frames (Bartunek, 1984; Goodman, 1990; Orlikowski & Gash, 1994; Tyre & Orlikowski, 1994). New gizmos are characterized by technological features that are beyond the reach of the great majority of organizational actors. In other words, the so called "objective" component of a new technology is not visible to every organizational actor. As a consequence, these actors look at new technologies through their technological frames. Such frames include metaphors and images created through organizational actors' beliefs and knowledge. According to Orlikowski and Gash (1994), homogeneous organization-actor groups originate similar technological frames. In this respect, technological experts may look at new technologies through a set of lenses that are different compared to those utilized by managers on the one hand, and end-users on the other. As a consequence, such frames lay the ground work for the emergence of different images of the new technology. This in turn may instigate hostile behaviours towards the new technology, such as resistance, rejection, sabotage, etc (Harrison & Laberge, 2002, Robey, 1979; Schultz & Slevin, 1975; Torkzadeh & Doll, 1999).

Once identified as the main factors that cause the emergence of misalignments between new technologies and the organizations adopting them, it is necessary to observe how organizations deal with such misalignments. According to the theoretical framework this paper takes advantage of, these misalignments disappear thanks to adaptive cycles involving both the technological and the organizational dimension. On one hand, the technology is modified and customized in order to fit into the organization adopting it. On the other, actions either at the macro or at the micro organizational level create the basic conditions for the homogenization of the technological frames of the organizational actors.

In this respect, the *implementation strategy* plays a key role in speeding up the adaptive cycles. According to Gallivan (1996) and Agarwal, Tanniru and Willemon (1995), it is possible to make a distinction among passive strategies, proactive strategies and total commitment strategies. Besides this classification, the implementation strategy encompasses a huge variety of actions aimed at dealing with the misalignment between the technological and the organizational dimension. Such actions may include providing incentives, implementing learning activities, promoting skill-building policies, modifying the graphic interface of a piece of software, etc.

In the third phase, the implementation process may be considered completed. Nevertheless, as this process is not linear, the so called "arrival-point" may be different from the one initially expected. In this respect, new opportunities may emerge and may originate new adaptive cycles. Figure 3 shows a descriptive scheme of the implementation process of Information and Communication Technologies.

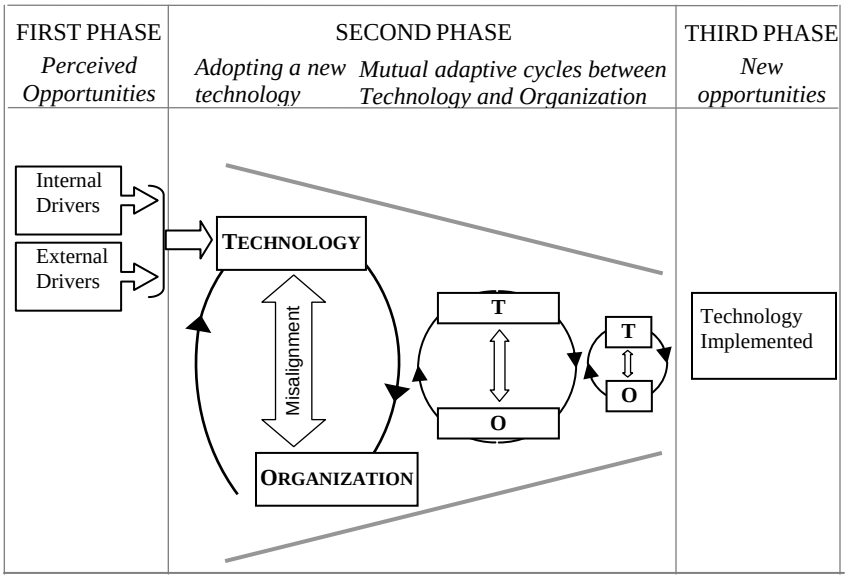
RESEARCH METHODS

This research was conducted in four steps.

First Step: To Identify an Institution That Has Implemented an E-Procurement System

Such an institution had to operate in the Italian public health care sector. In order to carry out a retrospective analysis, the implementation

FIGURE 3
The Implementation Process of Information and Communication Technologies



Source: DIEG (2003).

had to be completed at least 10 months before the field research started. This phase had been characterized by the analysis of secondary sources. More specifically, the analysis had been primarily focused on a project implemented by the Rizzoli Orthopaedic Institute in order to obtain the public funding aimed at developing the new EP system. Furthermore, the documents produced throughout the implementation of the new system had been taken into account. This made it possible to verify if the Rizzoli Orthopaedic Institute's case was interesting with respect to this study. Moreover this phase laid the ground work for the identification of the so called technology-organization adaptive cycles.

Second Step: To Implement an In-Depth Interview with the Manager Who Promoted the Adoption of the E-Procurement System

The interview was based on a semistructured questionnaire with open-ended questions and Likert's scale questions. More specifically, the first part of the interview was focused on collecting general information related to the Rizzoli Orthopaedic Institute (organizational structure, number of employees, supply-needs, etc.). In the second part, the manager was asked to describe the technology implemented and the organizational actors involved in such process. Subsequently, the manager was asked to portray the expectations that pushed him towards the adoption of the new EP system. Finally, the manager was asked to describe the critical phases the implementation process had to deal with and the way the Rizzoli Orthopaedic Institute managed to overcome them. In doing so, it was possible to obtain a brighter picture of the adaptive cycles identified through the analysis of the secondary sources implemented in the first step. The second part of this interview was extensively based on Likert's scale questions. This was instrumental in measuring the expectations of the manager, his evaluation of the critical aspects of the project, and his assessment of how the Rizzoli Orthopaedic Institute managed to deal with them. This part of the questionnaire was the same as the one submitted to both end-users and technology experts (see below). This made it possible to compare the evaluations of the manager with those of the organizational actors involved in the implementation process.

Third Step: To Carry Out In-Depth Interviews with People Involved in the Implementation Process

The sample encompassed 6 end-users working for the procurement office of the Rizzoli Orthopaedic Institute, 2 internal technology-experts, 2 external technology experts involved in the process. This sample was asked to answer the same questions as the manager with respect to the following aspects: expectations related to the new technology, evaluation of the critical phases, assessment of the way the Institute managed to overcome them. This made it possible to figure out if the statements of the end-users were either aligned or misaligned with those of the managers and the technology experts.

Fourth Step: To Compare the Outputs of Interviews

This step was instrumental in understanding to what extend expectations and technological frames among different organizational actors differed. Moreover, it provided a better understanding of the adaptive cycles that characterized the so-called implementation strategy.

The change in the legal framework may be considered the major driver that pushed the Rizzoli Orthopaedic Institute towards the exploitation of an ICT technology with respect to the purchasing function. Nevertheless, the high expectations of the manager leading the procurement department came into play as well. This manager declared: “I expected this new EP system to help us change the cultural attitude of our organization as regards to ICT-based innovation processes”. Despite such enthusiasm, the project-leader-manager asked the technology experts to carry out an extremely cautious implementation strategy. To begin with, this strategy created the conditions for basic ICT-related competencies to emerge. In this respect, the early stages of the implementation process had been characterized by the development of a “straightforward” web-site. This step made it possible to identify and test internal ICT-skills. In doing so, it prepared the ground for the implementation of a more complex ICT tool. Subsequently, this group of hi-tech-experts had been reinforced taking advantage of external actors. These experts had been extremely cautious in pushing forward the implementation process of the new e-reverse auction platform. More specifically, they devoted time and energy to the customisation of the platform. Such process was aimed at making the web-interface as similar as possible to the paper-base procedures that the organizational actors

used to take advantage of. In doing so, technology experts intervened in two respects, i.e. modifying graphical elements and creating new tools.

Initially, the enthusiasm of the manager leading the project was not fully matched by end-users. More specifically, the lack of ICT skills prevented them from completely understanding both the functioning and the advantages of the new technology. In this respect, the management facilitated the learning process through a series of initiatives aimed at explaining how to take advantage of the new software-based platform. One of these initiatives was focused on involving both internal and external users in a conference aimed at illustrating the advantages of the new system. According to the end-users, these actions helped them get a clearer picture of the technology being implemented. In other words, these initiatives fostered the homogenisation process of different actors' technological frames.

THE RESULT OF THE FIELD ANALYSIS

The field research refers to an e-reverse auction system implemented by the Rizzoli Orthopaedic Institute, which is one of the top-level public health care hospitals in the Emilia Romagna region. The Institute operates in two fields. On the one hand, it provides medical assistance. On the other, it implements research-related activities. About 1.100 people work for the Institute. The purchasing department - the one that takes advantage of the EP system - employs eight people.

Table 2 briefly summarizes the main technical features of the system. Both the web-based architecture and the Java based system made it

TABLE 2
Technical Features of the e-Procurement System

	Detailed description
Internal network	Users access the system through a local area network (LAN)
External network	Suppliers rely on Internet-connections via web-browsers. Connections are based on the HTTP protocol to secure the transmission of data.
Hardware	One cluster of two load-balance servers (a front-end server including an application server and a web-server)
Software	The system is developed mainly in Java J2EE and XML
Database	One Microsoft SQL 2000 server communicates with the EP system taking advantage of Java JDBC

possible to minimize the negative impact of purely technical problems on the implementation process. The system is web-based. Therefore, suppliers can access it through their own web browsers. In other words, they only need a personal computer and a reliable Internet connection. Therefore, suppliers are not asked to invest in new and expensive information and communication technologies. Last but not least, Java provided a flexible software solution, compatible with the legacy systems. Moreover, it made it possible to create a user-friendly graphical interface.

The change in the legal framework may be considered the major driver that pushed the Rizzoli Orthopaedic Institute towards the use of an ICT technology with respect to the purchasing function. Nevertheless, the high expectations of the manager leading the procurement department came into play as well. This manager declared: "I expected this new EP system to help us change the cultural attitude of our organization as regards to ICT-based innovation processes." Despite such enthusiasm, the project-leader manager asked the technology experts to carry out an extremely cautious implementation strategy. To begin with, this strategy created the conditions for basic ICT-related competencies to emerge. In this respect, the early stages of the implementation process had been characterized by the development of a "straightforward" web-site. This step made it possible to identify and test internal ICT-skills. In doing so, it prepared the ground work for the implementation of a more complex ICT tool. Subsequently, this group of hi-tech-experts had been reinforced, taking advantage of external actors. These experts had been extremely cautious in pushing forward the implementation process of the new e-reverse auction platform. More specifically, they devoted time and energy to the customisation of the platform. Such process was aimed at making the web interface as similar as possible to the paper-based procedures that the organizational actors used to take advantage of. In doing so, technology experts intervened in two respects, modifying graphical elements and creating new tools.

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external users in a conference aimed at illustrating the advantages of the new system. According to the end-users, these actions helped them get a clearer picture of the technology being implemented. In other words, these initiatives fostered the homogenisation process of different actors' technological frames.

The end of the implementation process coincided with the identification of new opportunities related to the further exploitation of the ICT. More specifically, the Institute is eager to take advantage of the e-procurement system to buy goods that cost more than 250.000 euros. However, to date the legal framework does not facilitate such strategy.

Table 3 describes the adaptive cycles that characterized the implementation process of the e-procurement system at the Rizzoli Institute. The different steps taken on the technology-side pushed the new EP system towards the organization implementing it. Similarly, the actions involving the organizational actors made it possible to homogenise their technological frames and reduced the misalignment between the technology and the organization.

To sum up, the implementation process was characterized by adaptive cycles involving both the technological and the organizational dimension.

TABLE 3
Different Steps in the Adaptive Cycles Involving the New EP System and the Organizational Actors of the Rizzoli

Steps	Organizational side	Technological side
1	To create a group of internal ICT-experts	To develop a web-site
2	To reinforce the ICT-expert-group taking advantage of external actors	To develop an e-reverse auction platform
3	To preserve customary purchasing procedures	To create a web interface that is as similar as possible to the paper-based-forms
4	To implement training activities	To customize the software providing it with additional tools
5	To illustrate technical aspects to 150 stakeholders (i.e. suppliers, internal users; government-representatives)	To test the platform through the implementation of 10 public tenders

With regard to technological aspects, the huge variety of Information systems public health care firms rely on makes it necessary to adopt flexible platforms. In doing so, it is possible to reduce the negative impact of legacy-related problems. Moreover, with respect to e-procurement, suppliers' information systems should be taken into account as well. As for the Institute, the supplier-base is highly fragmented. More specifically, it encompasses a huge variety of small and medium enterprises. In the light of this scenario, choosing a web-based system appears to be appropriate. In fact, as suppliers can participate in the e-auctioning process relying on their normal Internet connections, they are not required to invest in new ICT gizmos.

In regard to organizational aspects, the Italian health care system is far from being a homogeneous landscape. The huge diversity of lenses through which people look at new technologies fosters the emergence of highly differentiated technological frames. As a consequence, taking advantage of a cautious implementation strategy appears to be crucial. More specifically, that the new e-reverse auction system did not require any business-process reengineering move, could be considered a head-start for the implementation process. This aspect facilitated the mutual adaptive cycles that consisted, on the one hand, in the customisation of the software platform, and on the other in the implementation of training and sponsoring activities. As a consequence, the organizational actors' culture experienced a positive attitude towards ICT. In doing so, it fulfilled managers' expectations. Formally, the field analysis did not identify any major change in the organization of the Institute. This is true for the macro as well as for the micro level.

Nevertheless, the implementation process took full advantage of the support provided to the purchasing department by some external actors (i.e. hi-tech-buffs). Moreover, although not formally, some internal actors were provided with a higher degree of empowerment. Such empowerment oiled the interaction mechanisms among different organizational actors, both internally and externally. In doing so, it accelerated the implementation process.

As a result, the Institute managed to:

- reduce the time devoted to the implementation of the auction – related procedures,
- increase the number of suppliers submitting bids, and

- reduce the hard costs related to mail expenses

Table 3 contains updated data with respect to these three dimensions. For 2003, the supplier base did not change. In fact, at that time the EP system did not take advantage of an on-line data base with updated information. Therefore, the Institute established contacts with the same suppliers that used to participate in the paper-based bids. As a consequence, the new system did not manage to increase the supplier base. Rather, it massively reduced the time devoted to each bid and the mail expenditures. For 2004, it is not possible to calculate the savings of mail expenditures because traditional mail expenditure figures are no longer available. On the contrary, to integrate the supplier data base and the EP system facilitated the increase in the supplier base. This is mainly due to the simplicity and the accessibility of the new integrated system. Each supplier can subscribe independently. More specifically, it is necessary to fill an on-line form, indicating the typology of products the supplier is willing to provide the Institute with. Thereafter, if the bid refers to the typology indicated previously, the system will contact automatically the supplier. As a consequence, the on-line bids appear to be more transparent when compared to the paper-based bids.

TABLE 3
Results Achieved Through the E-Procurement System

	2003			**2004**		
	Traditional system	*E-procure-ment system*	%	*Traditional system*	*E-procure-ment system*	%
Time (days)	420	245	-41.6	70	47	-32.9
Suppliers	-	-		29	124	+ 327
Mail Exp.	€485	-	-100	-	-	

CONCLUSIONS

This paper represents the first step of an explorative study focused on e-procurement in the public sector. More specifically, such research is aimed at identifying a set of conditions under which different EP forms appear appropriate in different purchasing and organizational settings.

With respect to public companies, that the legal environment encourages the adoption of Information and Communication

Technologies represents a crucial pre-condition for EP systems to be effectively adopted and implemented. Rules and laws are a key driver in choosing the appropriate EP forms. In fact, they make it possible to identify if and how public companies can modify their purchasing processes. Consequently, the legal framework is important for the choice of the appropriate EP tool.

The perspective of this paper is an internal-organizational one. More specifically, it focuses on the interaction between the technological and the organizational dimension that makes it possible to implement a new EP system. Before choosing an appropriate EP tool, it is necessary to consider the key features of both dimensions and the way they interact in a specific setting. In regard to technological aspects, to implement a new EP solution in state-run firms could imply dealing with antiquated legacy systems. This may call for the adoption of a flexible architecture compatible with the systems public firms rely on. The need for flexible tools may be emphasized by the presence of a highly fragmented supply base made up of small and medium enterprises that usually are not eager to embark on high ICT investments. In this respect, web based solutions may reduce the need for capital spending.

On the organizational side, implementing major interventions at the macro-organizational level is most of the times beyond the reach of state-run firms. This is due, mainly, to a rigid legal framework and a static/bureaucratic organizational setting. Therefore, in such organizational settings EP forms that appear to be appropriate are those that call for interventions limited mainly to the micro-organizational level. More specifically, the effective implementation of EP tools makes it necessary to involve end-users that used to be marginalized in antiquated computer science projects. In other words, contrary to back-office automation projects, front-office automation ones are based on the effective contribution of organizational actors who are not considered to be computer buffs. Therefore, it is necessary to define the role of such actors in a more flexible fashion, focusing on aspects such as horizontal communication, autonomy and empowerment. Moreover, it is necessary to provide these actors with new skills that facilitate the use of ICTs.

This paper represents the first step of an explorative study focused on e-procurement in the public sector. It aims at identifying a set of conditions under which different EP forms appear appropriate in

different purchasing and organizational settings related to the Italian public health care sector. The further steps will be:

- Monitor the evolution of the Italian legal framework with respect to e-procurement policies in the Italian-public health care sector;
- Select and analyse a sample of case studies similar to the one presented above. More specifically, the analysis will be focused on the technologies being implemented, on the organizational settings implementing them and on the implementation strategies.

NOTES

1. The authors are grateful to Professors Guido Capaldo and Giuseppina Passiante for their helpful suggestions and valuable collaboration.

2. Although the paper is the result of the collaboration of the two authors, in this version, the third paragraph is by Gianluca Esposito, the second and fourth are by Lelio Raffa. The remaining parts stems from a collaborative work.

REFERENCES

Agarwal, R., Tanniru, M., & Willemon, D. (1995). "Absorbing information Technology Innovations: Strategies and Moderating Influences" (Working Paper). Dayton, OH: University of Dayton.

Allen, B. (2003). "E-procurement in the Canadian Government Unlocking the Potential." In *Proceedings of the 12th IPSERA Conference*, April 14-16, Budapest, Hungary: 353-364.

Arbin, K. (2002). "E-procurement in Maturity Industry." In *Proceedings of the 11th IPSERA Conference*, Enschede, The Netherlands, March 25-27.

Bartunek, J.M. (1984). "Changing Interpretive Schemes and Organizational Restructuring: The Example of a Religious Order." *Administrative Science Quarterly*, 29: 355-372.

Berger, P.L., & Luckmann, T. (1966). *The Social Construction of Reality*. Garden City, NY: Anchor Books.

Bichler, M. (2000). "An Experimental Analysis of Multi-Attribute Auctions." *Decision Support Systems, 19*: 249-268.

Bradley, S.P., & Nolan, R.L. (1988). *Sense and Respond: Capturing Value in the Network Era*. Boston, MA: Harvard Business School Press.

Capaldo, G., Esposito, G., Passiante, G., & Raffa, L. (2004). "ICT ed Imprese Knowledge Based." *Sviluppo & Organizzazione*, *203*: 79-94.

Capaldo, G., Raffa, M., & Zollo, G. (1994). "Management delle Imprese ad Alta Intensità di Conoscenza." *Sviluppo & Organizzazione*, *141*: 19-30.

de Boer, L., Harink, J., & Heijboer, G. (2002). "A Conceptual Model for Assessing the Impact of Electronic Procurement." *European Journal of Purchasing & Supply Management, 8*: 25-33

De Filippi, G., & Pennisi, G. (2002). *La Net Economy nella Pubblica Amministrazione*. Rome, Italy: Scuola Superiore della Pubblica Amministrazione.

Devadoss, P.R., Pan, S.L., & Huang, J.C. (2002). "Structural Analysis of E-Government Initiatives: A Case Study of SCO." *Decision Support System, 34*: 253-269.

Eisenhardt, K., & Brown. S. (1999). "Patching Business Portfolios in Dynamic Environments." *Harvard Business Review, 77* (3): 72-82.

Emiliani, M.L. (2000). "Business-to-business online auctions: key issues for purchasing process improvement." *Supply Chain Management: an International Journal, 1*: 11-19.

Esposito, E., Bruno, G., Mastroianni, M., & Vellutino, D. (2003). "Un Modello per la Valutazione di E-procurement del Settore Pubblico." In *Proceedings of the XIV Riunione Scientifica AiIG*, October, 30-31, Bergamo, Italy.

Esposito, G. (2003). *Il Processo di Implementazione delle Tecnologie ICT* (Unpublished Ph.D. Thesis). Department of Business and Managerial Engineering, University of Naples Federico II.

Gallivan, M.J. (1996). "Strategies for Implementing New Software Processes: An Evaluation of a Contingency Framework." In *Proceedings of the Special Interest Group on Computer Personnel*

Research SIGCPR/SIGMIS Annual Conference, Denver, Colorado, April 11-13.

Goodman, P.S., Griffith, T.L., & Fenner D.B. (1990). "Understanding Technology and the Individual in an Organization Context." In P. S. Goodman and L. S. Sproull (Eds.), *Technology and Organizations* (pp. 254-266). San Francisco, CA: Jossey-Bass.

Haeckel, S.H., & Nolan, R.L. (1993). "Managing by Wire." *Harvard Business Review*, *71* (5): 122-132.

Harland, C. (1996). "Supply Network Strategies – The Case of Health Supplies." *European Journal of Purchasing & Supply Management*, *2* (4): 183-192.

Harrison, D., & Laberge. M. (2002). "Innovation, Identities and Resistance: The Social Construction of an Innovation Network." *Journal of Management Studies*, *39* (4): 497-521

Knudsen, D. (2003). "Uncovering the Strategic Domain of E-Procurement." In *Proceedings of the 12th IPSERA Conference*, Budapest, April 14-16.

Kraljic, P. (1983). "Purchasing must become supplier management", *Harvard Business Review*, *61* (5): 109-117

Lenk, K., & Traunmuller R. (2000). "Presentation at the IFIP WG 8.5" *Working Conference on Advances in Electronic Government*, Saragoza, Spain, February 10-11.

Leonard, A., & Spring, M. (2002). "E-Procurement Must Become Supply Management: Portfolio Approaches and Electronic Procurement." In *Proceedings of the 11th IPSERA Conference*, Enschede, The Netherlands, March 25-27.

Leonard-Barton, D. (1988). "Implementation as Mutual Adaptation of Technology and Organization." *Research Policy*, *17* (5): 251-267

Majchrzack, A., & Salzman, H. (1989). "Introduction to the Special Issue: Social and Organizational Dimensions of Computer-Aided Design." *IEEE Transactions on Engineering Management*, 363: 174-179.

Min, H., & Galle, W.P. (1999). "Electronic Commerce Usage in the Business-To-Business Purchasing." *International Journal of Operations and Production Management*, *19* (9): 909-921.

Morton, M.S.S. (1991). *The Corporation of the 1990s*. New York: Oxford University Press.

Orlikowski, W.J., & Gash, D.C. (1994). "Technological Frames: Making Sense of Information Technology in Organizations." *ACM Transactions on Information Systems*, *12* (2): 174-207.

Parker, G., & Lawes, J. (2003). "Benefits of E-Procurement in Government." In *Proceedings of the 12th IPSERA Conference*, Budapest, Hungary, April 14-16.

Presutti, W.D., Jr. (2003). "Supply Management an E-Procurement: Creating Value Added in the Supply Chain." *Industrial Marketing Management*, *32*: 219-226.

Robey, D. (1979). "User Attitudes an Management Information System Use." *Academy of Management Journal*, *22* (3): 527-538.

Schultz, R.L., & Slevin, D.P. (1975). "Implementation and Organizational Validity: An Empirical Investigation." In R. L. Schultz and D. P. Slevin (Eds.). *Implementing Operations Research/management Science* (pp. 253-270). New York: American Elsevier.

Sprecher, M.H. (2000). "Racing to E-Government: Using the Internet for Citizen Service Delivery." *Government Finance Review*, *16* (5): 21-22.

Strejcek, G., & Theil, M. (2002). "Technology Push, Legislation Pull? E-Government in the European Union." *Decision Support System*, *34*: 305-313.

Teich, J., Wallenius, H., & Wallenius, J. (1999) "Multiple-Issue Auction and Market Algoritms for the World Wide Web." *Decision Support Systems*, *26*: 327-339.

Tiwana, A. (2000). *Essential Guide to Knowledge Management: The E-Business and CRM Applications*. Upper Saddle River, NJ: Prentice Hall.

Torkzadeh, G., & Doll, W.J. (1999). "The Development of a Tool for Measuring the Perceived Impact of Information Technology on Work." *Omega, 27*: 327-339.

Tyre, M.J., & Orlikowski, W.J. (1994). "Windows of Opportunities: Temporal Patterns of Technological Adoption in Organizations." *Organization Science, 5*: 98-118.

Weick K. E. (1995). *Sense Making in Organizations*. Thousands Oaks, CA: Sage.

Williamson, O. E. (1979). "Transaction-Cost Economics: The Governance of Contractual Relations." *Journal of Law and Economics, 22*: 233-261.