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ELECTRONIC MARKETS BUSINESS MODELS TO INTEGRATE PORTS IN SUPPLY CHAINS

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Abstract

The paper explores rationales and determinants of embracing specific e-Governance models as a mean to improve port governance and enhance ports integration in contemporary supply chains. In recent times the port sector has experienced a variety of organisational and policy reforms, aiming at adjusting to major external changes. Grounding on the structures of the emerging multi-faced and multi-actors port sector, the paper establishes both the significance and the applicability of advanced port e-Governance models, based in particular on e-markets typologies. The observations and the devised theoretical framework suggest that within the evolving variation of port structures, e-Governance public-private interorganisational network models and the e-market one–stop government model provide a great opportunity towards the most wanted 'smart networking' of the plurality of port actors. Acting as cluster managers, port authorities have an array of incentives to invest in action frameworks like the enactment of 'port authority centred e-markets', in order to enhance the performance of ports as parts of regionalised supply chains networks. By examining this perspective, the paper suggests the core features that may govern the implementation of this paradigm and enabling conditions wherein an electronic port e-Governance agenda can promote the interests of stakeholders.

Keywords: Port Governance, e-Government, port actors' collaboration

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INTRODUCTION

The port sector is in a state of transition. Major changes in the production process (geographical shift of production, just-in-time manufacturing, logistics and multimodal transportation, increased exploitation of new technologies), the widespread development of containerisation, the consequent operational reforms of world shipping (exploration of both economies of scope and economies of size) and the shift of political attitudes and regulatory regimes in favour of less state intervention (i.e. privatisation, proposals for the liberalisation of port services provision in the European Union), contribute towards this direction.

There has been a remarkable variance of port governance and policy restructuring to these, mostly external driven, changes. This variance reflects different approaches on the most appropriate form of port organisation. It results in the simultaneous presence of both public and private forms of port operations, which are governed by public or quasi-public port authorities. This range of these hybrid forms of port organisation is rather well documented (Brooks and Cullinane 2007; Bichou and Gray, 2005).

Since the introduction of the EDI (Electronic Data Interchanges) systems in the mid-1980s, the port sector has progressively endorsed several new information and communication technologies (ICTs) such as web portals, intranets, extranets and support software platforms (i.e. ERPs, Workflow Managements Systems) and communication platforms (i.e. RFID technology, wireless and sensor based systems) (Kia *et al* 2000).

However, the investigation of the significance and the potential of comprehensive e-Governance concepts with specific strategic, operational, and technological implementation and use options, towards the facilitation of port actors' responses to new competitive pressures, is a totally unexplored area.

This paper focuses on examining how e-Government and the implementation of specific ICT business models, such as the port public-private interorganisational networks, the one–stop electronic port model, and its transition to a pervasive and context-aware electronic port services paradigm might facilitate this ports adjustment process, and improve the position of the several actors involved in port operations.

THE CONTEXT OF ELECTRONIC PORT GOVERNANCE MODES

The analytical framework to be presented serves in guiding the development of innovative e-Governance models in this multi-faced and multi-actors sector; it is embedded in foundation theory of port policy and e-Government, regarding the nature of the contemporary port product, in the context of ICT ramifications, intra-port competition, ports spatial and functional regionalisation, and aspects of port policy reforms towards operational and governance devolution, resulting in hybrid forms of port operation.

The e-Government wave has caught the attention of not only the software and consultant industry, but also in the policy institutions, the public administration, and an increasing number of researchers. Although there indeed was solid research on ICT in government during the 1970s, 1980s, and 1990s and fundamental new research perspectives has been introduced with current e-Government wave.

e-Government defined as the facilitation of governmental and administrative functions and activities enabled by ICTs, range from general front-end services (i.e. ministry of transportation portal) to back-office automation (i.e. public ports document management systems) and intergovernmental services integration. Emerging are also ICT applications directed towards policy input and citizen/customer involvement. In essence, as national e-Government strategies are implemented transactions might become faster and information quality improves, along with strategic public management priorities promotion such as transparency, accountability and anti-corruption.

In particular, this analysis is based on recent advances regarding the electronic markets business models in order to illustrate their importance as applicable e-Government organisational and policy perspectives to the emerging port reality.

The synthesis of these two main research strands enables the formulation of the proposed conceptual framework that allows a broader understanding for enacting emergent ICTs and network business models within port organisational forms, institutional arrangements and assessing foreseen outcomes. Hence, in our paper both the significance and the applicability of advanced port e-Government models are explored.

The suggested framework proposes an *a priori* theory for electronic port governance and delineates the rationales and determinants of port multi-actors collaborative electronic networks, the enabling mechanisms and infrastructural underpinning for achieving the objectives of joint initiatives (strategic alliances, coordinated relationships) and electronic networks formation. The basic premise is that as the port policy environment perplexes, electronic markets offer intriguing possibilities and insights for port policy making and operations.

Our analysis and the theoretical propositions are approached as follows: first, the analysis outlines core factors of the contemporary port governance, in terms of its important institutional, structural, and organisational constituents, so as to yield insights into possible evolutionary paths of port entities and networks governance. These port governance elements provide the "hooks" upon which port actors may hang elements of enacted technology. Resembling an electronic markets typology, the competing influences on port network formation and the variety of interorganisational networks, render the technology enactment process outcomes uncertain. To overcome this unstable condition, this paper presents a set of observations and guiding propositions for theory-building towards a policy framework of knowledgeable port actors, in particular port authorities, trying to pursue their interests in enacting

technology. The emerging port interorganisational networks may be composed of equals, or may have one powerful central actor coupled with other actors relying on the central organisation for resources and exchange. In the case of port sector, the key actor responsible for cluster management is the port authority. Against this background, the paper also illustrates the possible rationales and underpinnings for a port-authority centred e-Governance network, based on features of electronic markets typologies.

CONTEMPORARY PORT GOVERNANCE CHALLENGES

The changing market context in which ports operate has played a key role in transforming the contemporary port product and inducing major port governance and policy reforms. Fundamental changes in the production and distribution of goods, industrial networks development, unitisation, short product lifecycles, and short time-to-market periods, are all variables that reduce the advantages of proximity to the port and increase the role of logistics (Helling and Poister 2000). Users' demand is characterised by a high level of differentiation. The responsiveness of ports to this differentiation conditions their competitiveness. Market shares depend on the provision of complementary, user-driven, value-added, port-related services, which are efficiently supplied in wider geographical areas. The efficient supply of these complementary services does not require the location of the production units within the port zone. Freight corridors expand further and many ports are creating the necessary conditions and infrastructure for setting up networks dedicated solely to multimodal transportation.

Product, Process, Actors

All these developments have led to port product variation and new organisational strategies. Ports provide both generic services with a standardised process defined in advance and dedicated services responding to individual demand and based on the mobilisation of specialised resources. Some parts and types of port operations continue to focus on standardised services, strong price competition and increased volumes of services, while others focus on increased range of services, concentrate on economics of variety and competition based on superior quality of products and services. So the port sector exhibits organisation structures that incorporate elements of different worlds of services provision (Chlomoudis *et al* 2003): along with the provision of services within the traditional (a) *industrial world*, port services are provided with reference to (b) an *interpersonal world*, based on dedicated specialised services, economies of variety, competition centred on quality, skilled labour, and uncertainty; and (c) the *market world*, based on dedicated but standardised services, economies of scale and differentiation, competition centred on price and response to demand, semi-skilled labour, and conditions of uncertainty.

With the overall port product becoming a chain of (specialised) interlinking functions (Suykens and Van de Voorde 1998), flexible (post-fordist) operational methods stand as a means to face the adjustment pressures (Notteboom and Winkelmans 2001). The large comprehensive port organisation, which is commonly based on large standardised processes, is outdated. The number of actors within a port complex multiplies both because more types of services are provided and because the same type of services is provided by more than one entity. Competition takes the forms of intra-port and intra-terminal competition. The former is a situation where two or more different terminal operators within the same port are vying for the same market and the terminal operator has jurisdiction over an entirely terminal area, for berth to gate, and competes with other terminal operators. The latter refers to companies competing to provide the same services within the same terminal (World Bank n.d.). Apart from preventing monopoly pricing, those responsible for port policy design and port authorities (cf. Pallis and Vaggelas 2005) advance the introduction of such competition between a plurality of providers of port products/services/facilities, as an engine of innovation and specialisation (De Langen and Pallis 2006). The monopolistic market structure of port services provision and any single corporate hierarchy are replaced by a network of organizations operating in different worlds of production.

With the advent of ICT enabled network business models, port product and processes are considered as "augmented" products and processes, as their traditional, physical nature is overplayed with an informational and electronics transactions component.

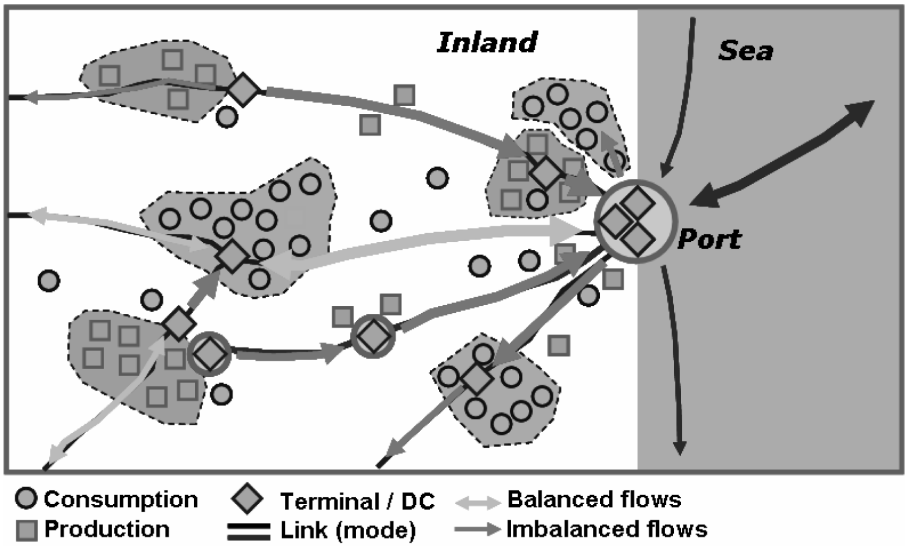
Regionalisation, Supply Chains Integration, Synchronisation

These developments are inextricably linked with the expansion of port hinterlands, and the emerging port regionalisation (Notteboom and Rodrigue 2005), that is the geographical and functional integration of ports in wider regions. To serve a specialised commercial and transportation context, ports use the comparative advantage of effective spatially fragmented locations that insure a better access to space, markets, labour, parts and resources. The resulting growing transport flows and spatially fragmented operational chains induce the need for functional integration. Ports attempt to link more efficiently the elements of the supply chain in order to insure that the needs of the customers are closely met by the suppliers in terms of costs, availability and time. The outcome is the transformation of ports to nodes of complex transportation networks, searching for means to be functionally and geographically integrated systems of locations and flows with the purpose of generating value (Figure 1).

With the rapid and pervasive restructuring of supply chains and of the logistics pathways in which ports are embedded, ports are now elements in value-driven

chain systems not simply places with particular, if complex, functions (Robinson 2003). The port captures value for itself and for the chain (i.e. shippers, third party service providers), while maritime companies demand further services specialization within the port area, and firms providing port services are interested in developing strategies to succeed in hugely complex environment and uncertainty. In the emerging flow-based system, demand needs to be synchronized more closely with supply, imposing a reorganization of freight distribution. There are multiple actors within the port complex and a number of actors that are involved within the wider supply chain, and the operation of all of them conditions port competitiveness. The overall context results in port policy reforms, aiming to redefine port governance and the role of the involved actors, within the new paradigm of ports as elements in value-driven chain systems.

Figure 1: Port regionalisation & intra-port competition: a multi-actors sector



Source: Based on Notteboom and Rodrigue (2005).

Governance Reforms and Actors' co-ordination

For all the reasons stated above, port planning is restructured, with new approaches implying a new role to be played by the port authority and a reassessment of the public sector involvement (cf. Mogli and Sanguineri 2003). Most of the port policy reforms have taken the form of port devolution, which is the transfer of functions or responsibility for the delivery of programs and services from the government to other autonomous port level entities (Brooks 2004). Within this alternative service delivery process, governments seek to become more customer-driven. This new public management is client-focused, entrepreneurial, innovative, and

intends to: (1) lessen centralized bureaucratic control and heighten the use of decentralized quasi-market mechanism; (2) decouple the government's policy-making function from operations; and (3) increase participation by non-government entities in the design and delivery of government programs and services (Brooks and Cullinane 2007). Several European (i.e. Italy, Spain, Greece) and non-European countries (i.e. Australia, Canada) have endorsed such policy, reforms searching for the 'one best way' to manage and organise a competitive port system.

The range of devolution alternatives adopted within the global ports sector varies (Cullinane and Song 2002), with the literature avoiding to make assumptions about the inherent superiority of one environment-strategy-structure configuration over any other (Baltazar and Brooks 2007). More important for this study is the post-reform role of the public sector. In public ports, where all regulator and landlord functions fall to the public sector, some, or all, operator functions may be undertaken under contract by the private sector, the control of the conditions of operation resides with the government. In the, most commonly observed, partial privatisation case, some operator and/or landlord functions are privatized, usually with the public sector retaining full control of the regulator function. In the less frequently observed case of full privatisation, all of the operator and landlord functions are transferred from the public to the private sector, but the government opts to provide regulator functions. There is widespread agreement that property rights, the existence of public goods, and the presence of externalities stand as valid causes of the existence of some form of public controlled port authority, even when port privatisation policies prevail.

As a result, hybrid port organisations exist in the intersection of two distinct spheres, the public and the private. Governments move away from the direct delivery of port services, yet they retains policy-making responsibilities, as its autonomous executive organisations (port authorities) establish long term relationship with private port operators performing services on the basis of management contracts. Limiting the conventional interventionist role, the state operates to a certain extent, as an external agent, which intervenes in the workings of the port economy from a position outside and above the situation of operations and with a view to maximising the common good, even in the context of a private sector port system (Gilman 2003).

Within this context, port stakeholders expect a minimum intervention in order to rectify problems associated with the workings of the sector. Still, there is a distinct role that public actors, in most cases port authorities, assume. This role is not restricted to 'effacing' the barriers to the operation of the market mechanism. The decentralised port development system demand port authorities to deploy strategies that produce adaptability, and direct systemic economic coordination towards interconnection, technical interoperability, and various forms of operational (intra-port, local, regional, hinterland, strategic) networking and integration (Newman and Walder 2003).

The sector is in a situation in which a variety of actors need autonomy to develop whatever worlds of production they find compatible. Those involved in the provision of port services are in a locked-in situation wherein they need a situated governor to ensure that their services are well coordinated. If this philosophy prevails, firms act to the best of their abilities allowing the inherently favourable possibility of multiple frameworks of action in port operations. When port governors favour the idea of allowing several independent enterprises to operate within a single port, operational networking results in significant competitive advantages, for the cooperation of firms who act within transportation chains. With ports being embedded in value driven systems, the providers of port services are increasingly competing not as individual firms but as parts of chains whose ultimate success depends on networking and integration of operating relationships, rather than on ownership and control of critical supply assets and consequent dominance of operations (Robinson 2003).

Against this background public and private actors, as well as public or quasi-public port authorities, are in the search of an efficient and effective networking that creates a competitive port community spirit that minimises difficulties in integrating ports with logistics and supply chains and help to establish the essential proactive approach to satisfy user demands.

For the port authority this search is important in order to function as the 'smart' institution that governs the implementation of network organisational forms, rather than as the 'conventional' port operator, or just as 'regulator'. It can undertake initiatives that redefine the operational framework and develop action frameworks that help to overcome inefficient operations and advance the co-operation of the several stakeholders, including service providers, third parties, or port users. Via networking, port authorities have the potential to overcome decisional and operating fragmentation generated by individual self-interest actions by firm(s) and coordinate actions towards customer-oriented structures of integrated port services according to users' context and situations.

ELECTRONIC PORT GOVERNANCE: THE FRAMEWORK

The e-Government wave has caught the attention of not only the software and consultant industry, but also the policy institutions, the public administration, and a constantly increasing number of researchers. Although there was solid research on ICT in government during the 1970s, 1980s, and 1990s fundamental new research perspectives have been introduced with the current e-Government wave.

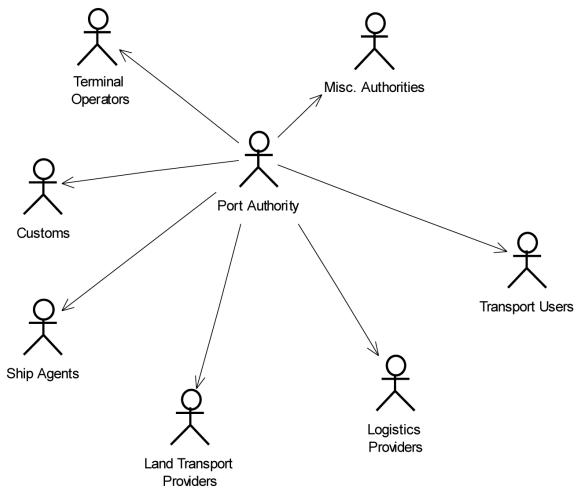
E-Government defined as the facilitation or transformation of governmental and public administrative functions and activities enabled by ICTs, entail applications that range from general front-end services (i.e. ministry of transportation one-stop portal) to back-office automation (i.e. public ports document management systems) and intergovernmental services integration. Emerging are also ICT applica-

tions directed towards policy input and citizen/customer involvement. In essence, as national e-Government strategies are implemented, strategic public management priorities, such as transparency, accountability, anti-corruption and enhanced citizen participation are promoted, transactions are becoming faster and more effective and information quality improves (Fountain 2001; Wimmer 2002; OECD 2005).

Public agencies need to move beyond the concept of separate and distinct entities by starting to see themselves as one holistic government that collaborates, shares information, and leverages on the collective knowledge, with the aim being to provide the general public or particular constituencies with better and integrated services in a convenient, continuous, agile and adaptive manner that enhances innovative and collaborative practices (Ke and Wei 2004).

Successful inter-organisational collaborations (as illustrated in Figure 2) in e-Government require due respect for the interests and expectations of each participating entity, without introducing obvious threats or unnecessary speculations that challenge its existence or autonomy (Fountain 2001). In this vein, adjustments are inevitable for balancing the respective organisations' objectives and constraints and can be better reached with an adequate institution structure in place.

Figure 2. Port value chain stakeholders



The significance of cross-agency collaborations in e-Government singles out the importance of an institutional framework for explicitly stipulating the collaborative (working) relationships among autonomous entities, public or private that participate in an e-Government initiative (Dawes and Prefontaine 2003). To provide and deliver online one-stop services, the participating actors have to collaborate, streamline, and integrate the respective services and operations, which historically have

been departmentalised, or in the case of sectors as ports were provided by a single organization rather than multiple due to the application of the linear mass services production system. 'One-stop service' is not a novel concept (Wimmer 2002; Lambrou 2003). In fact it has been exploited in the e-Government domain, as an innovative model, in particular within a framework that supports (a) leadership and management control at all different levels, and provides (b) defined rules and procedures to the overall decision making, and (c) the mutual adjustments of the participating actors (Jen-Hwa Hu *et al* 2006). The preceded elements are required for reaching and enhancing consensus and building trust among participants.

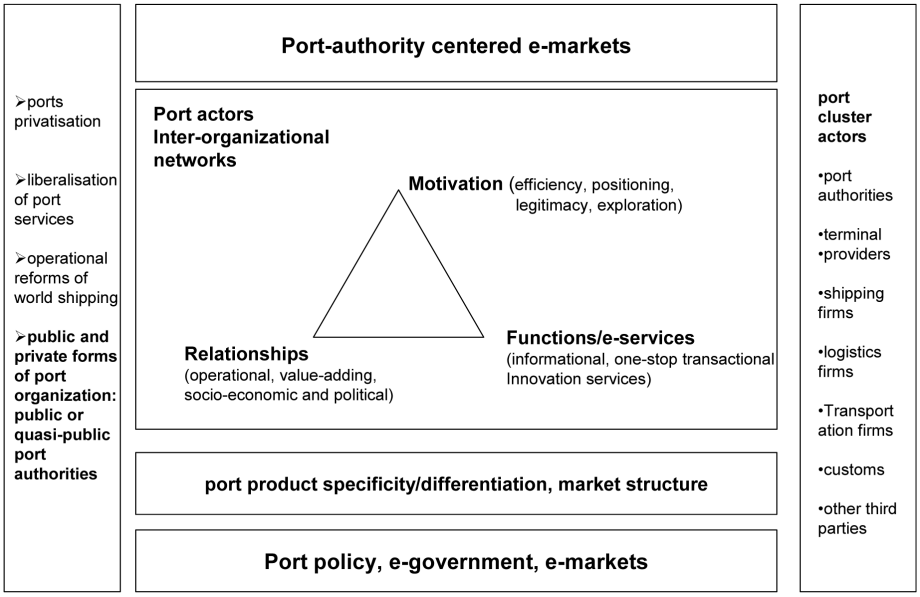
During the last decade, and in parallel with the development and spreading of ICT, government agencies have leveraged tools and new collaboration between agencies, to a considerable extent. A consolidation of paradigms is needed, however, in order to establish a clear baseline and wide consensus on concepts and terminology and good practices for e-Government in the near future. Against this background, future, innovative scenarios for e-Government initiatives are necessary. Deeper understanding of the complex interplay of technological, organizational, and social factors and processes in both e-Business and e-Government might lead to practice-relevant, cross-fertilization and improve our understanding of the nature and origins of both similarities and differences between the evolutionary trajectories of the two public-private spheres (Scholl, 2006).

Port authority centred e-markets

The available theory and empirical results on e-markets models (Fountain 2001) may serve as an appropriate policy-making basis and tool in order to rationalise and determine port inter-organisational networks centred on a revamped port authority role; actually this paradigm is in accord with the contemporary port governance and policy restructuring, where the simultaneous presence of both public and private forms of port operations, which are governed by public or quasi-public port authorities is emerging and port authorities are seen as the perfect 'cluster port manager' (De Langen 2003).

The proliferation of B2B e-markets has generated a growing academic interest in the phenomenon and although its applicability and ramifications are still not conclusively studied and understood, a plurality in design and operation options is apparent. An e-market is defined as a system that allows market participants to exchange information about prices and product offerings electronically and conduct business transactions (Granados et al 2007; Gottschalk and Abrahamsen 2002; Kaplan and Sawhney 2000; Chircu and Kauffman 2000; Malone *et al* 1987). As Le *et al* (2004) outline in a thorough overview of concepts, taxonomies and possible instances of e-markets, e-markets are designed to exploit certain market opportunities, while individual e-market types differ from one another with respect to their

Figure 3: Port centered e-markets framework.



target users, underlying market structures and respective ownership, product/service offerings, value propositions, and provided functionality.

Hence, based on established taxonomies and models one can envisage the existence of a port e-market paradigm where port supply and demand is aggregated, matched and facilitated via an institutional e-Governance infrastructure that ensures meaningful port inter-organisational network relationships between the various actors related to one port cluster.

A framework present by Gosain and Palmer (2004) conceptualises e-markets as network orchestrators that generate value by creating exchange opportunities and facilitating economic and social exchanges.

On these grounds a port-authority centred e-market might be the mean for orchestrating three types of network linkages that create value for their participating organisations in three distinct ways (Figure 3):

— Orchestration of information linkages (i.e. communication) that result in improving information exchange and the processing of port operation related information (such as vessel pre-arrival notifications, cargo handling information, customs declaration information etc).

— Orchestration of value linkages that result in improving transactional characteristics that drive change in port stakeholders' organisation and operational integration (such as electronic process integration, port based intermodal transportation and logistics services and transactions coordination and execution).

— Orchestration of relational (i.e. socio-economic integration) linkages that result in improving social, economic and political relationships and make available resources embedded in these port stakeholders relationships.

The expected benefits of using e-markets, or the underlying motivational factors, are seen for both the buyers and suppliers participating in an e-market.

Regarding the *intention to participate in inter-organizational networks*, Cheng *et al* (2006) explore in particular the moderating effect of intention to e-collaborate on governance mode. They argue that the intention to e-collaborate will moderate the effects of the three decision contexts, namely the threat of opportunism, the threat of commercial failure, and the opportunity for sustainable advantage, on the two identified governance modes (e-collaboration versus arms-length relationship).

Reviewing the literature on *motives for participating in e-markets* activities, Rask and Kragh (2004) conclude that there is a matrix with four types of motivating factors for using and/or participating — namely, efficiency, positioning, exploration and legitimacy — which are based upon the dimensions of drivers (internal versus external) and the nature of the decision (planned versus emerging).

Based on the aforementioned frameworks, one can adapt its postulation regarding port-authority centred e-markets models, in order to determine the possible port service providers' and port users' motives for taking up e-markets activities:

— More specifically, the *efficiency* motive accounts to a decision to participate in e-markets which is driven by an internal objective to obtain organisation-specific advantages and is made as a result of careful evaluation of the expected outcome. Port users can generally be highly motivated by process efficiency, particularly in terms of reducing time, increase reliability, deploy new strategies corresponding to a globalised trade environment (i.e. hub and spoke practices), but also in terms of achieving lower prices. Port service providers are expected also to show interest in reducing process, time, and costs, and increase services efficiency, in terms of specifying parts of the operation in which they should focus and implementing novel concepts (i.e. just-in-time, door-to-door services) demanding integration with spatially separated (regionalised) complementary entities.

— *Positioning* appears as a strong reason for both port service providers and port users to participate in e-markets. The port sector dynamic economic context and the continuous alteration of the port competitiveness hierarchy are driving forces towards participation in e-markets. Port authorities, public administrations, port service providers and port users, are all actors interested to increase their positioning within a port complex. At the same time they are interested in the overall positioning of this complex vis-à-vis other ports competing for the same region. The positioning motive is important in order to increase both market reach and potential.

— As regards the motive of *legitimacy*, e-market participation can be driven by external factors rooted in the relationships of an organisation in the port value chain with other organisations, and may occur as the result of ongoing negotiations between port governors, operators, and/or users. The legitimacy motive is very real for many port services providers, especially in terms of their eagerness to follow existing customers.
— *Exploration* is a possible motive for port actors as well. To some extent, port service providers, in particular, might base initial e-market participation on trial and error, with the decision to continue participation being a direct result of actual experiences.

Port e-markets typology

Caputo *et al* (2004) proposed an integrated model the allows to identify the more appropriate set of organizational structures, managerial criteria and critical activities, based on variables characterizing the environment in which an e-supply chain is embedded. Yang *et al* (2007), explore, in broader terms, the feasibility of applying an internet-based information system to facilitate business alliance activities, and they conclude that communication and information sharing are the most appropriate *activities* in business alliances for the application of an internet-based information system, whereas the decision to adopt an internet-based information system is dependent on the allied partners' support and the technological capabilities they possess.

As far as the transportation sector, in particular, is concerned, Song and Regan (2001) provided a general overview of the features, trends and the market situation regarding freight transportation e-markets/intermediaries. Li and Shue (2003) proposed a framework for developing an air cargo infomediary and outline the impact and benefits it accrues to the cargo logistics chain. Granados *et al* (2007) present a theoretical framework and apply it to the air travel industry, arguing that determinants such as public policy, product characteristics that favour electronic trading and competitive (market) and institutional forces that promote industry competitiveness enable the move to transparent (air travel) markets.

As Sharifi *et al* (2006) argue a strategic framework for the identification and selection of an appropriate e-marketplace approach can include a classification model, the key dimensions of which are the nature of the products/services to be traded, the ownership/formation of the marketplace and the level of functionality/relationships exhibited by the trading exchange.

Hence, based on the aforementioned arguments, it is argued that port authority centred e-markets can act as catalysts for efficient port product trading. The nature and complexity of the port product, in terms of its high degree of variation and specialization, as well as its time, price and brand sensitivity favour an e-marketplace appropriateness.

In terms of ownership, a market can be characterised as independent (vendor led), sector coalition (sector led) or privately owned (Sharifi *et al* 2006). Lee at al (2004) determine certain features of particular e-market types, including the industry-sponsored e-markets (ISMs), the third-party exchanges (3PXs) and private e-marketplaces.

Against this background, two applicable models can be considered as e-hubs for port sectoral operations execution: *(i) port industry-sponsored e-markets* defined as consortia e-markets co-founded by port sector leaders (such as private terminal operators and public port authorities) and *(i) port third-party exchanges* defined as neutral e-markets founded by a port authority, where a number of participants both at the supply and the demand side (many-to-many) are performing information exchange and electronic port transactions, centred on aggregating fragmented supply and demand for greater market efficiency (Table 1).

Table 1: Port authority centered e-markets.

Electronic Port Governance models	**Port authority centered e-markets Functions**	**Port authority centered e-markets value proposition**
port industry-sponsored e-markets	• Cargo and passenger handling e-services • Pilotage and towage e-services • Customs and immigration e-services • Vessel traffic services and safety e-services • Maintenance and repair services e-services • Waste disposal • Landside and berth e-services • Logistics and hinterland e-services • Facilities, freight , passenger security e-services • Emergency services e-services • E-marketing of operations	❖ Port services supply and demand aggregation/integration ❖ Port services demands and offers matching ❖ Market transparency ❖ Trust, facilitation and interests settlement ❖ Efficiency ❖ Reach ❖ Protection of public interest on behalf of the port community ❖ Determination of port policy, and safety and environment policies applicable ❖ Negotiation capabilities and participatory modes of port governance
port third-party exchanges	➢ port service search ➢ port service reservation/order ➢ status tracking ➢ port service catalogue ➢ port service negotiations and auctions ➢ port service provider search ➢ back-end integration ➢ port supplier buyer rating ➢ RFQ ➢ collaborative planning	

Port industry-sponsored e-markets and port third-party exchanges can operate either as public e-marketplaces or on a mixed mode basis offering both public e-markets services, open to all qualified participants, and private e-markets services, available to a closed set of participants; this model is in contrast to a third type of e-market that is a private e-market which is built by a leading port service supplier (i.e. terminal operator) or a port service buyer (i.e. shipping company) to link itself with its own group of port business partners.

Port industry-sponsored e-markets may emerge where a few large port service providers or port users can bring along substantial volume of business (Le *et al* 2004). Their presence can make a port industry-sponsored e-market appear one sided and less appealing to other port market participants. Port industry-sponsored e-markets hold an advantage not available to port third party exchanges: ready access to the large trading volume of their founders that can help them build market liquidity. A bigger advantage for port industry-sponsored e-markets may lie in their position in the supply chain. When industry leaders are among their founders, port industry-sponsored e-markets seem well placed to facilitate the development of uniform standards for transmitting data, describing products and coordinating business processes, as well as to gain wide commitment to a common information platform.

Taking into account these postulations, when the public port authority assumes the role of a port cluster manager interested in investing and promoting port innovation and efficiency, it is worth considering and developing port authority centred e-markets, following a hybrid port industry-sponsored e-market or port third-party exchanges model as a platform for supply chain integration that fosters port cross-organisational collaboration for strategic advantage, depending on the actual embeddedness of port actors' networks in political, structural, economic and institutional factors.

Regarding the functionality of a port-authority centred e-market, it comprises e-services whereby port supply chain actors can be informed, communicate, and transact, thus including informational, transactional and value-adding, innovative port e-services, namely port service search, port service reservation/order, status tracking, port service catalogue, port service negotiations and auctions, port service provider search, back-end integration, port supplier buyer rating, request for proposal/quotation, and collaborative planning.

CONCLUSIONS

The paper provides a conceptual framework for electronic port e-Governance integrating arguments from two different strands and theories (a) the contemporary policy, organisational, operational and technological issues and trends in the port sector and (b) the converging elements of e-Government and e-markets. The emerging hybrid form of port organisation, involving a plurality of port actors provides a dynamic sectoral paradigm that creates incentives for inter-organizational

collaboration and operational synchronisation. Specific e-market models work towards this direction, whilst a public port authority is situated in a central role for promoting in practice the efficiency of a port cluster.

A port might benefit if the port authority employs new ICTs and operational models, in specific e-market typologies like the proposed port industry-sponsored e-market and port third-party exchange, and act as the 'smart' institution that governs the implementation of network organisational forms. This development would redefine the operational framework and help to overcome inefficient operations, and advance the co-operation of the several port stakeholders. Port-authority centred e-markets contribute to overcome decisional and operating fragmentation and coordinate actions towards customer-oriented structures of integrated port value chains.

The presence of multiple service providers leads to the expansion of the geographically concentrated, mutually related, business units, associations and public-private organisations that are centred on a port complex. Relationships become perplexing and port governance demands the management of numerous (internal, external, public policy, and community) stakeholders' relations.

Overall, 'networking' as based on the advancement of a rational coordination, for operating and strategically developing a port, with core features as outlined in the port authority centred e-market paradigm, can revamp port authorities in a new blended virtual agency role, that is a combined physical and electronic mode of operation. The port authority centred e-market paradigm supports the role of the port authority as a 'network orchestrator' that acts with positive network externalities for its participants.

Given that the port authority performance is by definition related to the performance of the whole port cluster, the authority has incentives to invest in action frameworks that enhance the performance of the network, in particular the enactment of port authority centred networks supported by ICTs and the proposed port e-markets models.

The present paper proposes a theoretically robust framework and offers a basis for diagnosing applicable modes in port governance choice. The proposed framework does not present any prescription of how to enact ICTs in port settings, develop port e-markets and initiate a strategic alliance or how to succeed in such a relationship. Instead, it guides the attention to the question of applicability of innovative e-Governance modes, in particular the port-authority e-markets types examined.

The next step is to empirically examine the motives, relationships, important functions and value propositions specified in the model by means of an empirical survey, in varying port market settings. The present research contributes to the existing port policy and e-Government literature by developing an integrated model for port actors' e-collaboration and ports e-Governance. By empirically supporting the proposed relationships and modes of operation, one can identify possible mechanisms to improve port actors' performance and competitiveness, via ICT enacted reciprocity.

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