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3.1.3 – PORT PROCESS MAP

Author(s): PROF. JENS FROESE, PHANTHIAN ZUESONGDHAM
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LIST OF ABBREVIATIONS /GLOSSARY

- BSC – Balance Scorecard
- ERP – Enterprise Resource Planning
- WP – Work Package



1 Introduction

Seaport is a very complex area with many business activities and stakeholders involved. Its core role is that of a node in a logistics network. Other possible roles like e.g. providing attractive residential areas (compare e.g. Sydney, London, Oslo, Hamburg) or providing shelter for yachts are not relevant in the context of EFFORTS and are not further considered here.

The port definition after Notteboom (2000) therefore suits EFFORTS purposes best: *a seaport is a logistics and industrial centre of an explicit maritime nature that plays an active role in the global transport system and that is characterised by a spatial and functional clustering of activities that are directly and indirectly involved in seamless transportation and information processes in production chains.*

Eight years later most ports are still not entities in a "seamless transportation and information chain" but struggle with heterogenic industries interfering with each other, competition between similar services like e.g. terminal services and inconsistent organisation.

Organisational structure and administration of the port differs its service portfolio¹. According to the World Bank Port Reform Toolkit mainly four port management systems can be distinguished

- Public Service Port
- Tool Port
- Landlord Port
- Fully Privatized Port.

The state-owned port is responsible for the administration of land and property which belongs to the port areas and not for the superstructure which is to be built on the terminal. On the other hand, the private-owned port is acting as an ordinary commercial entity and earning their profits from port-related activities from renting land to operating container terminal. The methods of working between two different kinds of port are therefore probably different. This sometimes creates misunderstanding of the issues even though people were discussing to the same business activities.

Therefore, this problem could be solved if the discussion is not based on the organisational or other specific point of view but the generic one. WP 3.1 investigated this issue and found that by linking "process" to any other elements of the port operation is the most suitable way to have a simple, easy-to-understand approach of description how port is organised and structured. This approach could avoid redundancy of the activities made to the same process. By using it, each process will be captured only once even though it is handled by many stakeholders. The concept is universal and neutral for any port types.

¹ S. Nettle (1988, pp. 14-27)



This paper aims at describing the process map which was developed within the WP3.1 task 1 and elaborating the possible areas of application and implementation to other tasks / work packages within EFFORTS.

2 Executive summary

The WP 3.1 EFFORTS deals mainly with the organisation of the port. However, this organisation is not the classical term in daily use. Since each port has different administrative organisational types, the business activities and the corresponding responsibilities are not in the same line. The task 3.1.1 aims at capturing port processes as the main activity as we are convinced that the description of the port organisation by the process approach is universally applicable for every seaport. This is because, this approach could avoid redundancy of the activities made to the same process. Each process in port operation is occurring once even though it is handled by many stakeholders.

Throughout this deliverable the main problems and the motivation of developing the port process map is explained. According to the nature of the business as network, seaports and their relevant entities, both public and private, are always interdependent and need to collaborate in interoperable way so that they can exchange information effectively.

By establishing port process map as a typology of EFFORTS, the first step of having a common understanding and framework in port operation is achieved. The map is applicable and implementable in many areas once the process must take an important role as a systematic framework for discussion and development of work in specific issues such as environmental management, risk management, training and education, etc.

3 The process map

3.1 Universal approach to describe seaport complex

Before explaining the EFFORTS process map in detailed, a brief of reasons to select this approach must be elaborate. There are many problems for the people working or relating to the port organisation especially in the international environment of the European ports make the situation very difficult to cope with. These include:

- language barriers;
- diverse semantics of similar objects;
- same terms for distinct objects;
- different historical and educational background, competences, experiences and associated social and cultural environments;
- distinct mental models of system operation and associated roles



- various attitudes of problem solving

This situation can only (partly) become overcome by an unambiguous way to capture and describe systems and processes. It is obvious that talking about ports does not necessarily result in the same common understanding of ports' roles and compositions.

The terms of reference for WP 3.1 are covering manifold aspects:

- Common understanding of ports, modules and services
- Unambiguous allocation of EFFORTS activities to the complex and heterogenic port world
- Providing a consistent and comprehensive taxonomy for all EFFORTS activities
- Supporting management of ports and port services
- Identifying synergies
- Contributing to improved competitiveness of ports
- Providing an IT-compatible structure.

In the beginning of the project, many discussion rounds have been organised among partners from all over Europe and from various port-related industries to get the more concrete picture and idea what is going on here. It became very obviously that all partners were in "Babylonian" environment where everyone could talk to each other but only a few persons shared precisely the same understanding of issues of interest.

Therefore, to solve this problem the consortium has to agree on architectural system views and process mapping to generate a digital image, so-called **Topology**, of the port reduced to its relevant essentials.

For instance, the port of Hamburg is a complex area where many activities are executed both port-related and non-port-related. In the figure 1, it is obvious that the port area does not only include cargo terminals but also warehouses, shipyards, manufacturers, service companies, etc. Mostly these industries sometimes do not have direct activities to the ports. However, they are located in the port areas which possibly will be affected by port activities. The good example for this is the traffic in port area. When the port is congested by truck carrying containers from terminal to hinterland, those trucks have to pass all the industrial areas which could cause huge traffic problems for them. They sometimes complain for the peak-hours when a big container vessel is calling port of Hamburg.

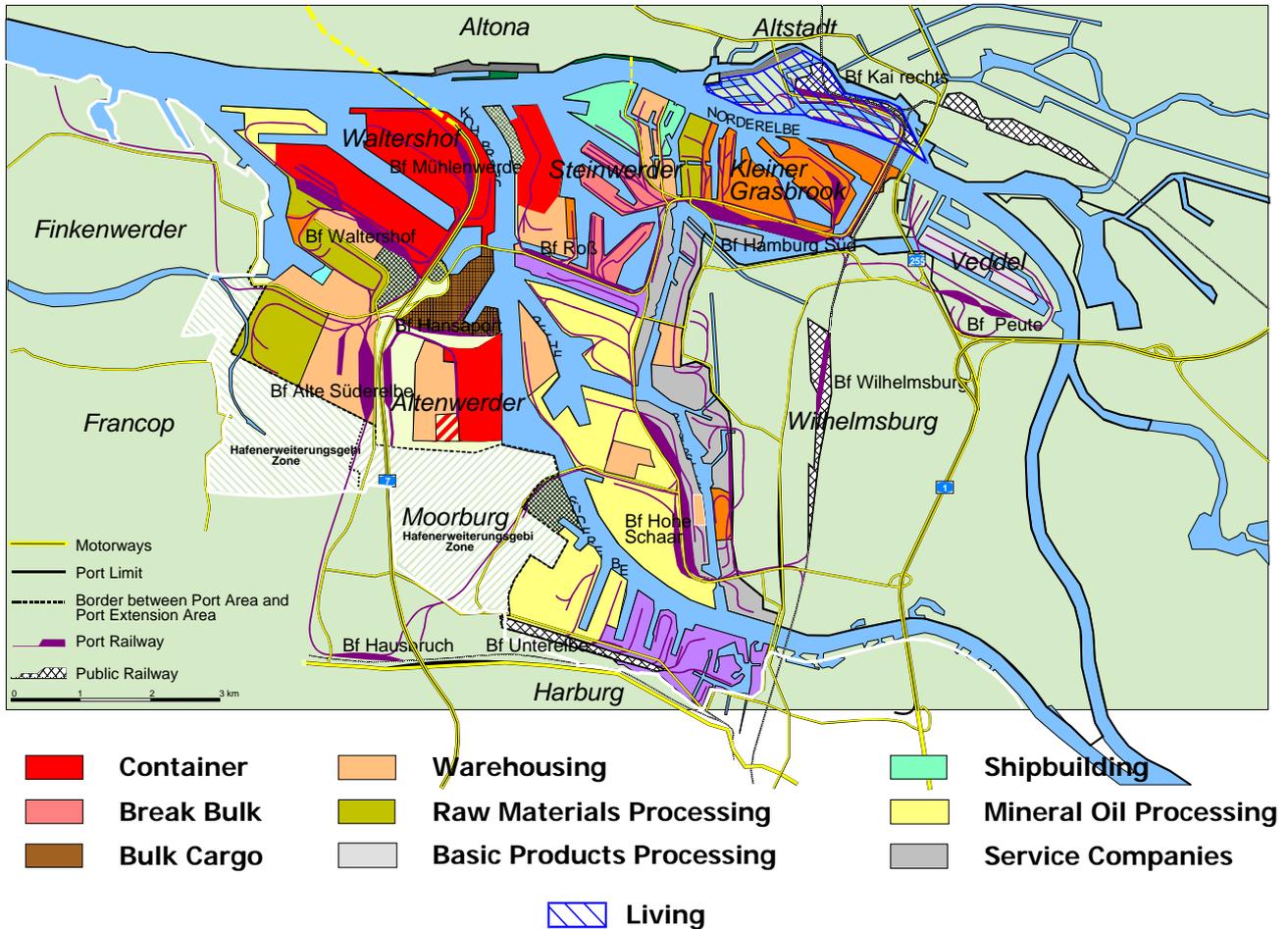


Figure 1: Utility Map of Port of Hamburg

(Source: Hamburg Port Authority)

The example of Hamburg port is to show the complexity within the port area of only one port. However, since the sea transport is an international issue. Communication and collaboration between ports and the relevant stakeholders are not avoidable. This results in the issues of interdependency and interoperability that ports have to concern.

Figure 2 demonstrated how the port, enterprises and administrations within the port area and across the ports are seen as a networked system.

Being involved in such a network, the ports are interdependent with other types of organisation tremendously. In this case, there are two types of interdependencies. Firstly, the “real” interdependency which is really directly involved between the port activities and the port-related entity such as berth allocation at a terminal for a vessel. This type of interdependencies must be well organised to smoothen the port operations.

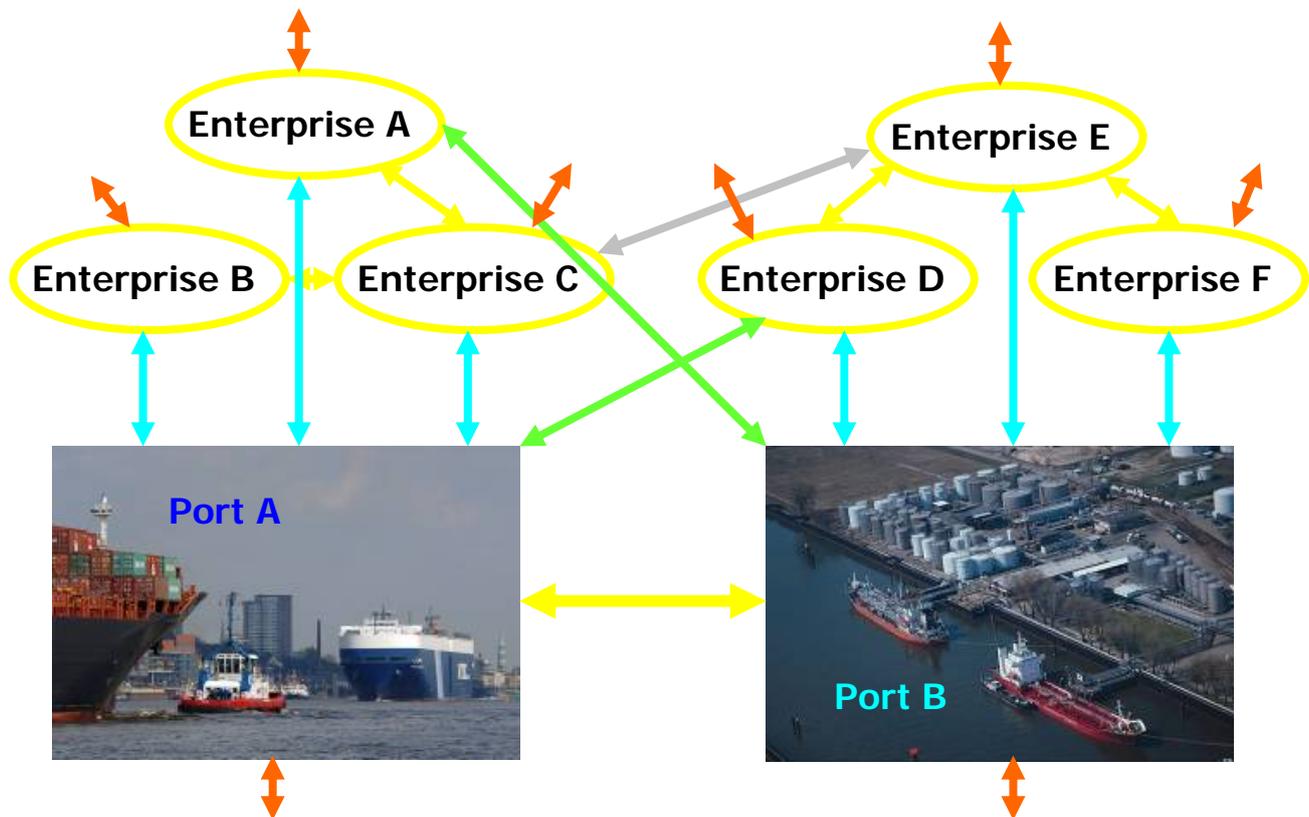


Figure 2: Port Network

The second type is “artificial” interdependency. For example, a refrigerated container with meat may only pass the terminal gate once it has been checked by the veterinary service. The activities of artificial interdependency are not directly linked to the port operation but also required for execution which must/could be removed or at least reduced from the port area.

From this standing point, a comprehensive of various dependencies on distinct hierarchical levels is essential.

The second main issue about the port complex includes “interoperability”. It means that the different systems should be able to communicate and exchange the significant information to each other with reliability, without any misunderstanding and loss of data. This could be done by reducing the variety of interfaces between the large number of port internal and external systems as well as logistics providers and others. Therefore, agreements on a restricted number of generic interfaces are required here.

Any interoperable and effective IT tools require clear and unambiguous systems without any redundancies whereas the real world is rather fuzzy with redundant responsibilities, documents, information etc. Therefore it is a cumbersome way to “translate” a whole complex heterogenic industry like the port industry into a transparent and logic structure ready for advanced IT-applications like e.g. service



oriented architecture (SOA) probably the most efficient way to capture and manage services under both, the business and the technology aspect.

Explained in simple words SOA aims at reusable services by orchestrating them into business processes. In business the term "process" covers an activity or a sequence of activities to fulfil specified objectives. A process therefore has a starting and a concluding point. Processes can be described on abstract and generic levels and in a very detailed and fragmented way. There are software tools available to capture and manage processes. EFFORTS therefore chose the process approach to map and understand the port industry.

Due to the main problems mentioned above, it is necessary that EFFORTS partners have the same platform for common understanding to improve effectiveness and efficiency of ports. Here the common concept is called "ontology". The EFFORTS ontology is a conceptualisation of the extremely heterogeneous and complex port world which allows for:

- common understanding
- cooperative and concurrent development
- providing a taxonomy to relate e.g. activity costing, resource utilisation, risks and training to processes
- matching individual Enterprise Resource Planning (ERP) tools with overall port clusters
- application of Balanced Scorecard (BSC) tools
- sustainable approach to base further enhancement and development in the future.

3.2 Port process mapping

It is very important in EFFORTS that each entity in the port complex knows what is really its responsibility and in which group it is categorised. To have such an overview, process mapping plays an important role to help illustrate in a clearer picture.

There are many approaches of mapping processes, each organisation normally use different way to map its structures, main activities or key processes within its own to suit the objectives of the organisation in doing business or management.

To map processes in single company is not complicated and takes a certain period of time depending on the complexity of the organisation. In the port community the process mapping is on another higher level of doing so. Since port industry composes of many single organisations both port-related and non-port-related business. To understand how this complex is functioned and linked to each other, port process map is required.

Therefore, the process mapping activity in the project EFFORTS is different from the common approach since it does not only map the processes within one single



company department or enterprise but for a kind of whole industry city with additionally a large number of administrative entities.

Since each entity has different purposes and aims to do different activities or business, an objective-neutral-process mapping is used. This means there is no objective specified when mapping the process in the port community but the need to serve a wide variety of potential later applications.

To realise this, the primary goal is set to achieve a common understanding of a complex industrial environment. After this, due to limited time period of research, the second step of work will identify areas for potential improvement.

After drafting and communicating with many port experts from consortium and non-consortium partners, the first final version of EFFORTS Port Process Domains is finished and illustrated in the figure 3.

The port process map (figure 3) shows main five domains which could be categorised in the port and their sub-branches show the meta-processes and process clusters to elucidate domains to practitioners. So far, each domain has clear definition and the categorization of the sub-branches which could be elaborated as follows:

- Domain **"Marine"** associates mainly to navigational issues and all processes of the port operation which have relations to the ship operations when calling at the port.
- Domain **"Infrastructure"** includes all activities in regards to the land and water infrastructure of the port such as fairway management, road / rail management, etc.
- Domain **"Logistics"** links the processes in relation to the operation taking place in the port area among ship, terminal and cargo / passengers.
- Domain **"Interfaces to Port Periphery"** correlates the activities which are not directly linked to the port operation but that could be affected or influenced by the processes executed in the port area.
- Domain **"Public"** encompasses all processes which are normally linked directly to the public entities and can have influences on the port operation as well as other stakeholders in the port area such as customs, police, security, fire brigade, etc. Also guidelines and regulations issued by these entities are also categorized under this domain.

Due to the broad scopes of port process, in the EFFORTS Project only processes associated to the development of project work will be captured and analyzed. Following to this basis provided in EFFORTS, other processes can be captured and modelled beyond the project period. Moreover, when the processes are changed due to any new technologies or evolution of port operation, such details are also modifiable in later stage.



Meta Processes

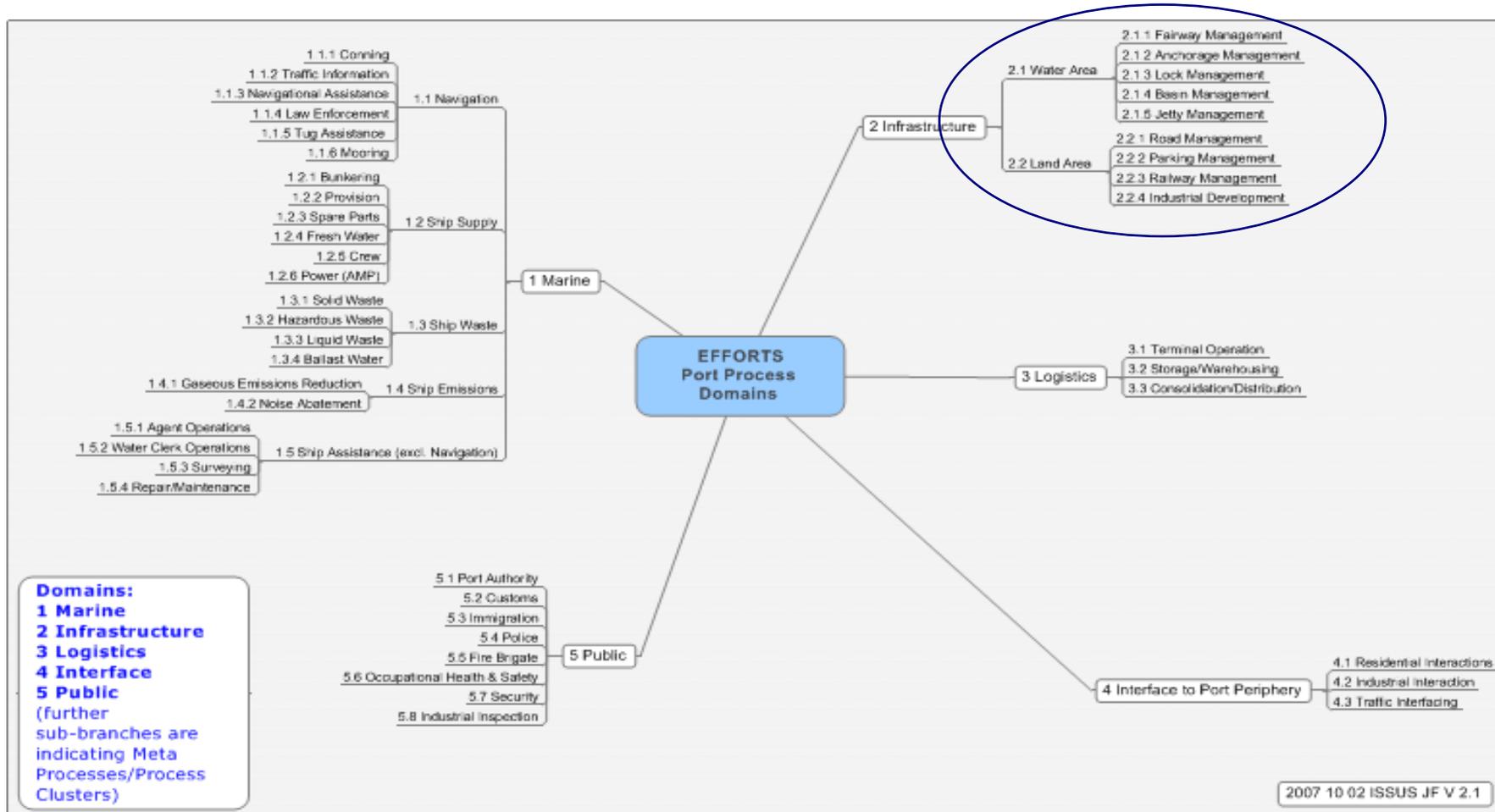


Figure 3: EFFORTS Port Process Domain



When the process domains are defined, the next step is to model the selected process. There are some certain steps to follow. However, the first and the most important question here is the objectives of the process that is to be modelled and not the tasks.

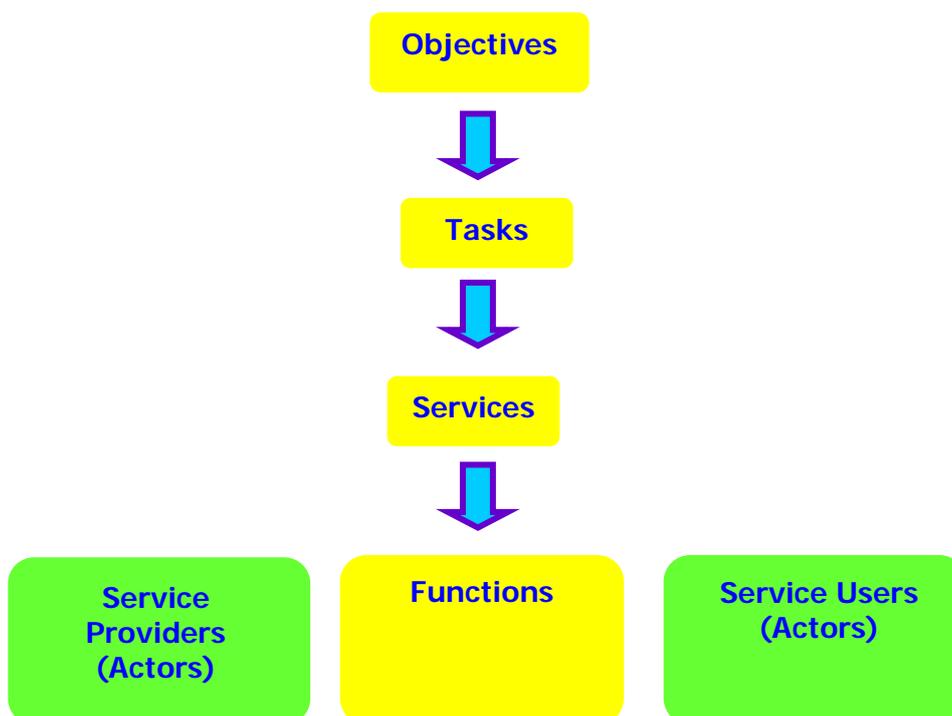


Figure 4: Process Modelling - The logical question

The figure 4 illustrates the starting point of process modelling activities which is initialised by the question of process objectives. Then, it follows by which tasks are needed to perform so that those objectives are accomplished. The tasks then can be acted as service which at the end delivers the functions for the process which the service providers offer to the service users.

The table 1 shows the association between the process domains and the work packages in EFFORTS. The relevant processes in EFFORTS scope will be captured and analyzed according to the needs and requirements of further use of information.



Table 1: Association of Process Domain Map and EFFORTS Processes

Domain	Meta - Process	Process Cluster	Associated Work Packages		
1. Marine	1.1 Navigation	1.1.1 Conning	N/A	WP 1.3 WP2.3	
		1.1.2 Traffic Information	WP 1.2		
		1.1.3 Navigational Assistance	WP 1.2		
		1.1.4 Law Enforcement	N/A		
		1.1.5 Tug Assistance	WP 1.1		
1.1.6 Mooring		N/A			
1.2 Ship Supply	1.2 Ship Supply	1.2.1 Bunkering	WP2.3		
		1.2.2 Provision	N/A		
		1.2.3 Spare Parts	N/A		
		1.2.4 Fresh Water	N/A		
		1.2.5 Crew	N/A		
		1.2.6 Power (AMP)	WP 2.1		
1.3 Ship Waste Disposal	1.3 Ship Waste Disposal	1.3.1 Solid Waste	WP 2.2	WP2.1	
		1.3.2 Hazardous Waste	WP 2.2	WP2.1	
		1.3.3 Liquid Waste	WP 2.2	WP2.1	
		1.3.4 Ballast Water (Oily Water, Bilge Water)	WP 2.2		
1.4 Ship Emission	1.4 Ship Emission	1.4.1 Gaseous Emission Reduction	WP 2.3	WP2.1	
		1.4.2 Noise Abatement	WP 2.4		
1.5 Ship Assistance (excl. Navigation)	1.5 Ship Assistance (excl. Navigation)	1.5.1 Agent Operations	N/A		
		1.5.2 Water Clerk Operations	N/A		
		1.5.3 Surveying	WP 1.3		
		1.5.4 Repair/Maintenance	WP2.1		
2. Infrastructure	2.1 Water Area	2.1.1 Fairway Management	WP 1.3	WP2.1 WP2.1	
		2.1.2 Anchorage Management	N/A		
		2.1.3 Lock Management	N/A		
		2.1.4 Basin Management	N/A		
		2.1.5 Jetty Management	N/A		
	2.2 Land Area	2.2 Land Area	2.2.1 Road Management	WP2.1	WP2.3
			2.2.2 Parking Management	WP2.1	
			2.2.3 Rail Management	WP2.1	
2.2.4 Industrial Development			WP2.1		
3. Logistics	3.1 Terminal Operation		WP 3.1		
	3.2 Storage / Warehousing		WP2.1		
	3.3 Consolidation / Distribution		N/A		



4. Interface	4.1 Interaction with Residential		WP2.4	
	4.2 Non-Port related Industrial Activities		WP2.3	
	4.3 Port-External Transport and Traffic Interfacing		N/A	
5. Public	5.1 Port Authority		WP 3.1	WP2.1
	5.2 Customs		N/A	
	5.3 Immigration		N/A	
	5.4 Police		N/A	
	5.5 Fire Brigade		N/A	
	5.6 Occupational Health and Safety		N/A	
	5.7 Security		N/A	
	5.8 Industrial Inspection		N/A	

Remark:

The following WPs cannot be associated directly to any specific domain since they cover all WPs.

1 WP 3.2

2 WP III

N/A = Not Applicable

4 Application of the port process map in EFFORTS

Since EFFORTS needs a topology to be a central point of common understanding, the process map is therefore linked and integrated with development working of other WPs.

In WP III – Education and training, process map is used as a structural scheme for the courses offered by each port of how these courses can be linked to the process. By this mean, many analyses and benefits can be achieved for further development of training courses such as

- Determining the potentials of interchange of available courses as well as trainers between the ports
- Defining the courses which could be necessary to people working for specific processes in port but not yet offered so far
- Defining the needs of worker's competencies to each process



- Creating the same level quality standard of training courses to the same level among European countries
- Allowing the completeness of the training courses corresponding to port processes in the map and vice versa

In WP 3.2 – Risk management framework, available hazards are captured and associated to the relevant process according to the process map. This will help, for example, port to have a clear picture of what processes are affecting when a specific hazard is likely to happen within the port area by the port operation and activities. Each port is able to make up a customised contingency plan corresponding to its needs and situation.

In WP 2.1 (Clean Energy Management), activities which are consuming energy (in the largest sense being fuel, electricity, gases...) are captured and associated to the relevant process according to the process map. This is also the case in the WP 2.3 (Port Air Quality) for activities which have impacts on the air quality. This will help port to have a clear picture of which processes have impacts on the energy consumption or on the air quality (the two being besides generally strongly linked).

These applications are at least four examples of the integration effect which could make of the usage of the process map. The exploitation of this map to other WPs is ongoing to achieve the best possible result of EFFORTS.

The EFFORTS port process map is modifiable to the extent of the port operation which could be occurring in the future. The map is easily extensible and dynamic.

The processes which are described and mapped as diagrams will be available also on the EFFORTS website – PMP (Process Modelling Platform) where all interested people and the project partners can have access to see the processes which are involved in the port operation. Both PMP and this document will be a living documents and source of information since the development of process description will be a continuous process and can also change overtime.

5 Conclusion

The complexity of the port and many barriers to common understanding of the port activities were the starting point of how the port process map become essential for the EFFORTS project. The systematic port process capturing can help all stakeholders of ports to cross over such challenges and achieve better collaboration as well as exchanges in their businesses.

This deliverable has shown how the process map is derived and it is structured as such to enable the usability for any kind of port to exploit the knowledge derived from the map.

The port process map has shown five main domains, their meta-processes and process clusters, there under all possible port processes can be categorized or classified. These domains include marine, infrastructure, logistics, interfaces to Port Periphery and public.



The port process map is, so far, a basic scheme of further development works in other WPs such as WP111, WP2.1, WP2.3 and WP3.2. This shows the feasibility of the approach.

Moreover, the port process map or deliverable 3.1.3 will also be a living document for knowledge on processes of the port operation and be updated in parallel to the PMP where the processes will be illustrated and accessible for any interested parties.



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