



Acronym: COLUMBUS

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Knowledge for Sustainable Blue Growth
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Deliverable 5.2

Progression of Knowledge Outputs To Knowledge Transfer

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EXECUTIVE SUMMARY

Objectives

WP5 objective is to develop a comprehensive and robust analysis of different attributes and stipulations of Knowledge Outputs (KOs) collected in WP4.

The ultimate aim of the Knowledge Analysis step is to identify, from the collection of Knowledge Outputs carried out in WP4, those with higher potential to realise an impact in the context of contributing to Blue Growth as well as Marine and Maritime Governance. Each Knowledge Fellow will address this objective in the specific context of the Competence Node he/she has been assigned.

The generation of a **Knowledge Output Pathway (KOP)** leads to the identification of a target user(s) who is(are) then profiled. The information gleaned from each KOP and the profiling of the identified target user **provides the basis to design, and subsequently implement, Knowledge Transfer Plans (KTP)** in WP6.

This report aims to illustrate how the KOP informs COLUMBUS decision to move a KO down through the pathway to achieve impact. It will be explained the relevance of KOP components to decide to go ahead with the next step in the transfer process or not, and how the KOP should feed the design and implementation of a KTP.

Moreover, the report will demonstrate how the context provided by the Competence Node Profile and by the type of knowledge transfer that is most suitable for a KO (science-to-science; science-to-industry; science-to-policy and science-to society) will make it necessary to adapt the KTP accordingly, and validate the thesis that there is no fit-for-all knowledge transfer formula. Rather than that, significant progress in knowledge transfer can be achieved if a comprehensive and adaptive methodology like the one proposed by COLUMBUS is implemented.

Rationale

In D.5.1. it was described how the analysis process was carried out through its different steps in COLUMBUS methodology and the lessons learnt to complement the methodological approach from the practical accomplishment of the analysis process. D.5.2 will focus specifically on how to use the information from the analysis process to identify the specific actions needed to achieve the eventual impact and how to use these actions to feed the Knowledge Transfer Plan.

According to D.2.2 “A Knowledge Output Pathway can be one step or a series of steps required to carry a Knowledge Output to its Eventual Impact. Where there are a series of steps, it will include detailed mapping of the steps, the users involved at each step and their predicted role in the pathway to Eventual Impact.”

Looking at different examples of KOPs under development within COLUMBUS and exchanging information about the process with the Knowledge Fellows, may reveal some shared patterns as well as differences on how Knowledge Transfer processes can be enhanced in different contexts. Among other things, this report concludes that the analysis process as planned in COLUMBUS has been demonstrated adequate as a previous step to generating an efficient Knowledge Transfer Plans. It also remarks that COLUMBUS methodology is sufficiently adaptive however, some barriers for its application and understanding will need an additional effort by CN members and WP leaders, particularly to fully exploit the potential of COLUMBUS network in its Knowledge Transfer mission.



1 INTRODUCTION

1.1 Background

The COLUMBUS project aims “to ensure that applicable knowledge generated through EC-funded science and technology can be transferred effectively to advance the governance of the marine and maritime sectors while improving competitiveness of European companies and unlocking the potential of the oceans to create jobs and economic growth in Europe (Blue Growth)” (COLUMBUS Description of Action¹).

The COLUMBUS structure was designed to achieve this aim as a result of the completion of a **knowledge transfer cycle** underpinned by the accomplishment of some key complementary support actions such as the analysis of the demand, the setup of a suitable methodology and an efficient communication plan:

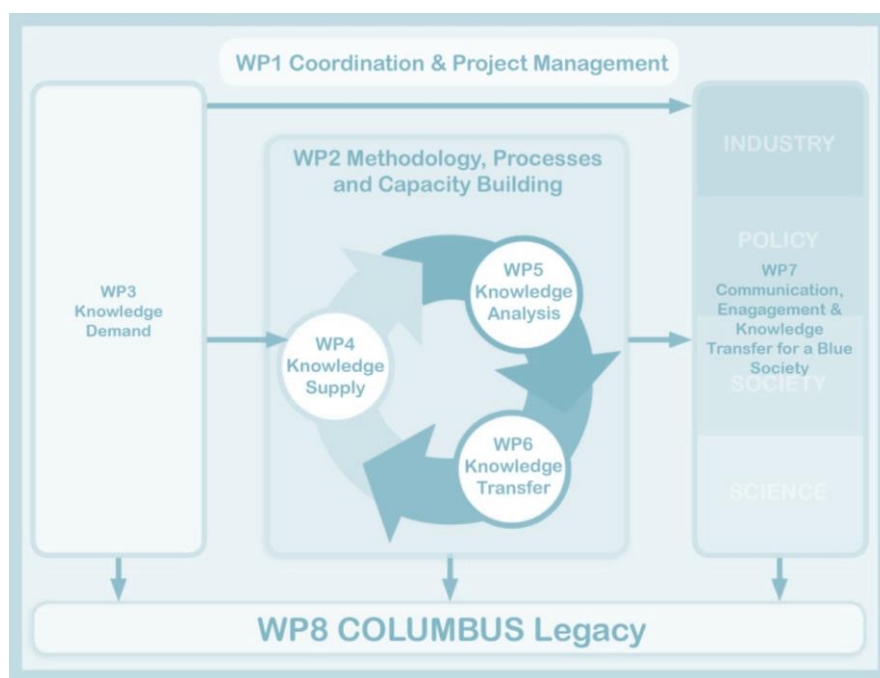


Fig.1. COLUMBUS pert Diagram

The **Knowledge Transfer cycle** consists of implementing a series of methods and tools to connect, from our insight of knowledge demand (knowledge gaps, needs, challenges, etc.) relevant for Blue Growth and Marine and Maritime governance, with specific users on the industry, administration, academia or society, by increasing and improving for them, the availability of value added knowledge and technologies. **COLUMBUS** has been designed to demonstrate Value Creation of EU funded research outputs for a wide range of end users in the Blue Growth, and Marine and Maritime Policy context. While WP2 is focused on building and improving knowledge transfer methodologies, protocols and templates, WP3 has carried out a process to identify knowledge needs from an end-user perspective. This is to guarantee that COLUMBUS efforts are focused on knowledge that has a high potential to be

¹ COLUMBUS Description of Action. Grant agreement n° 652690



impactful if transferred. WP4 collects projects based on specific keywords identified in WP3 relating to key challenges, barriers and knowledge needs for each of the sector(s) covered by the COLUMBUS nine Competence Nodes. From these projects, Knowledge Outputs are collected and prioritised, according to their perceived ability to respond to these challenges, with a dual objective of making knowledge collected publicly accessible through the EurOcean_KG - Marine Knowledge Gate, as well as feeding into WP5.

WP5 objective is to develop a comprehensive and robust analysis of different attributes and stipulations of Knowledge Outputs collected in WP4.

The Specific Objectives are:

- Review and analyse all Knowledge Output Tables (KOTs) developed in WP4
- Provide Context for each collected Knowledge Output
- Map Knowledge Output Pathways (KOP's) to Impact
- Identify the most suitable person(s) to target
- Estimate the application and subsequent impact of uptake by target users
- Approve suitable high potential Knowledge Outputs to move to WP6 (Knowledge Transfer)

1.2 Organisation of this report

This report aims to illustrate how the KOP informs COLUMBUS decision to move a KO down through the pathway to achieve impact. It will be explained the relevance of KOP components to decide to go ahead with the next step in the transfer process or not, and how the KOP should feed the design and implementation of a KTP.

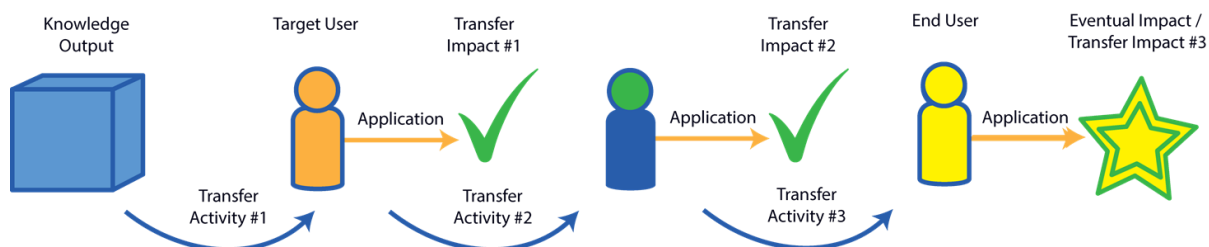


Fig. 2 Visualizing the Knowledge Output Pathway (source: COLUMBUS Knowledge Transfer Handbook)

Moreover, the report will provide conclusions extracted from looking at different examples of KOPs developed in COLUMBUS and from the direct consultation about the process to the Knowledge Fellows. This may reveal the existence of some shared patterns as well as of outstanding differences on how Knowledge Transfer processes can be enhanced in different contexts.

The process described in this Deliverable will be carried out at least three times during the project lifetime, as there are three cycles of Knowledge Transfer planned for this project. Therefore, two updates of this document are envisaged, one in month 22(Dec. 2016) and the other in month 28 (June 2017). However, these dates may suffer some adjustments due to foreseeable changes in the time planning for second knowledge transfer cycle. This report was produced during the first COLUMBUS Knowledge Transfer cycle.





1.3 Terminology

This document uses several COLUMBUS keywords which have been defined in the COLUMBUS deliverable “Knowledge Guidelines on carrying out COLUMBUS Knowledge Transfer and Impact Measurement” (D.2.2, 2015) as follows:

- **Knowledge Transfer:** The term for the overall process of moving knowledge between knowledge sources to the potential users of knowledge. Knowledge Transfer consists of a range of activities which aim to capture, organize, assess and transmit knowledge, skills and competence from those who generate them to those who will utilize them.
- **Knowledge Output:** A unit of knowledge or learning generated by or through research activity. They are not limited to de-novo or pioneering discoveries but may also include new methodologies/processes, adaptations, insights, alternative applications of prior know-how/knowledge.
- **Knowledge Output Pathway:** This can be one step or a series of steps required to carry a Knowledge Output to its Eventual Impact. Where there are a series of steps, it will include detailed mapping of the steps, the users involved at each step and their predicted role in the pathway to Eventual Impact.
- **Eventual Impact:** The ultimate end benefit of the application of the Knowledge Output. It is defined as an enhanced situation that is contributing to “Blue Growth” including the implementation of the Marine Strategy Framework Directive. *(This is not to be confused with the impact of an intermediary user taking up knowledge and transferring it down a step in the knowledge output pathway to Eventual Impact. This is termed “Transfer Impact”).*
- **Exploitation partner:** An external organization/institution/individual who has an interest and/or expertise that may assist in transferring that Knowledge Output down to the Knowledge Output Pathway to its Eventual Impact.
- **Transfer Impact:** The demonstrable evidence that a Knowledge Output has travelled down a single step on the Knowledge Output Pathway.
- **Target User:** The individual(s) who you have identified in your Knowledge Output Pathway to whom a Knowledge Fellow will transfer the Knowledge Output.
- **End User(s):** The individual(s) who will apply the Knowledge Output at the end of the Knowledge Output Pathway.
- **A Competence Node** is a network organised within COLUMBUS to ensure there is a competent team with sufficient critical mass to carry out a technology and knowledge transfer process as a peer community. COLUMBUS comprises a total of 9 Competence Nodes addressing key activities, both sectoral and cross-cutting, of particular relevance for Blue Growth and Marine and Maritime Governance.
- **Knowledge Fellow.** The Knowledge Transfer Fellows’ primary job role is to ensure Knowledge generated via European Research is effectively transferred to different end-users who can take up and apply the knowledge resulting in significant value creation. Each Competence Node in COLUMBUS has been assigned a Full-time Equivalent Fellow for a minimum of 24 months.
- **Knowledge transfer cycle:** Each of the three rounds planned in COLUMBUS comprising KO collection, KO analysis (with KOP design and target uses profiled) and transfer planning and development (including the measurement of impact).





1.4 List of acronyms

KO	Knowledge Output	TRL	Technology Readiness Level
KOT	Knowledge Output Table	PC	Project Coordinator
KOP	Knowledge Output Pathway	WP	Work Package
CN	Competence Node	OoT	Oceans of Tomorrow
KF	Knowledge Fellow	FP7	Seventh Framework Programme for research and innovation.
KT	Knowledge Transfer		

2 METHODOLOGY

The meaning of the word **accessible**:
adjective

1. easy to approach, enter, use, or understand
2. **accessible to**, likely to be affected by; open to; susceptible to
3. obtainable; available

Source: Collins English Dictionary, digital edition 2012.

It is crucial to understand knowledge transfer and what it means that knowledge transfer consists in making the knowledge accessible to its users. If a given knowledge output is valuable for application and we make it accessible for the users, then the chances for uptake and for the generation of impact will increase significantly. This is the reason why COLUMBUS defines **Knowledge Transfer** as *the overall process of moving knowledge between knowledge sources to the potential users of knowledge. Knowledge transfer consists of a range of activities which aim to capture, organize, assess and transmit knowledge, skills and competences from those who generate them to those who will utilize them.* Although this seems conceptually simple, succeeding in putting knowledge transfer into practice may take significant efforts and requires a careful strategy, the follow up of the implementation of knowledge transfer actions and the smart measurement of their impact.

The ultimate objective of carrying out analysis on the knowledge outputs is to determine, from the universe of Knowledge Outputs collected in WP4, those with higher potential to realise an impact that has relevance in the context of Blue Growth and Marine and Maritime Governance. Each Knowledge Fellow in COLUMBUS will address this objective in the specific context of the sector(s) covered by the Competence Node he/she has been assigned.

The generation of a **Knowledge Output Pathway (KOP)** is a key component of the transfer process and leads to the identification of a target user(s) who is then profiled. The information gleaned from each KOP and the profiling of the identified target user **provides the basis to design, and subsequently implement, Knowledge Transfer Plans** in WP6. Therefore, the objective of characterizing a Knowledge Output Pathway is to visualize the picture of the principal elements to be considered for the design of an efficient Knowledge Transfer Plan, i.e.:

- the position of a given Knowledge Output in its context for application



- information about the main drivers and barriers conditioning the application of the identified Knowledge
- basic information about potential users and alternative uses
- information about the key events representing a chance/obstacle for knowledge transfer
- a deeper understanding of the eventual impact and about who can/should do something to realise this impact.

With this information in place, COLUMBUS Fellows, having enriched the information they handle with the inputs from their Competence Node Teams, will be in a condition to trace the ideal Pathway and to profile the target user or target user(s) who should play a role in this Knowledge Output Pathway.

How can Knowledge Fellows gather all the information elements to trace the Knowledge Output Pathway?

Some guiding questions to gather the relevant information for the design of a Knowledge Output Pathway were initially proposed by the COLUMBUS methodology templates (provided by WP2) for the analysis phase. Following you can see some of the questions guiding the KOP design:

- Describe the sectoral landscape (e.g. value chain, policy process) for which your Knowledge Output has a potential application.
- What are the key activities/milestones that are expected to happen within this landscape?
- Who are the actors (organisations or individuals) with specific roles/responsibilities within your sector, who have relevance to your Knowledge Output, and what are their roles?
- What eventual impact can be achieved through the application of the KO you are analysing and in this landscape?
- Who can release this impact as a target user and as an end user? How are the target user(s) and the end user(s) connected? What activities do they need to foster the use of knowledge and the progress down the KOP until the eventual impact is reached?
- Are there any Exploitation Partners who may assist in transferring the Knowledge Output down to the Knowledge Output Pathway to its Eventual Impact?

Although COLUMBUS templates are being evolved throughout the project to become more friendly and adaptive, accordingly to the experiences of the different Competence Nodes, these basic questions remain making part of the process rational, and therefore, of the KO analysis. COLUMBUS Knowledge Fellows need to go through them at some moment to assure that they are bearing in mind all the aspects which may condition the transfer activities they could plan and their potential impact.

In fact, the need to adapt to the characteristics of each Competence Node and prove the flexibility of the methodology proposed, also derives from the need to show that there may be cases where impact can be achieved with extremely simple KOPs and others that will need much more complex approaches. There may be cases where transfer to impact can have various routes and the analysis should help Knowledge Transfer professionals (the Knowledge Fellows in COLUMBUS) making a decision on which of these routs can represent the optimal strategy.



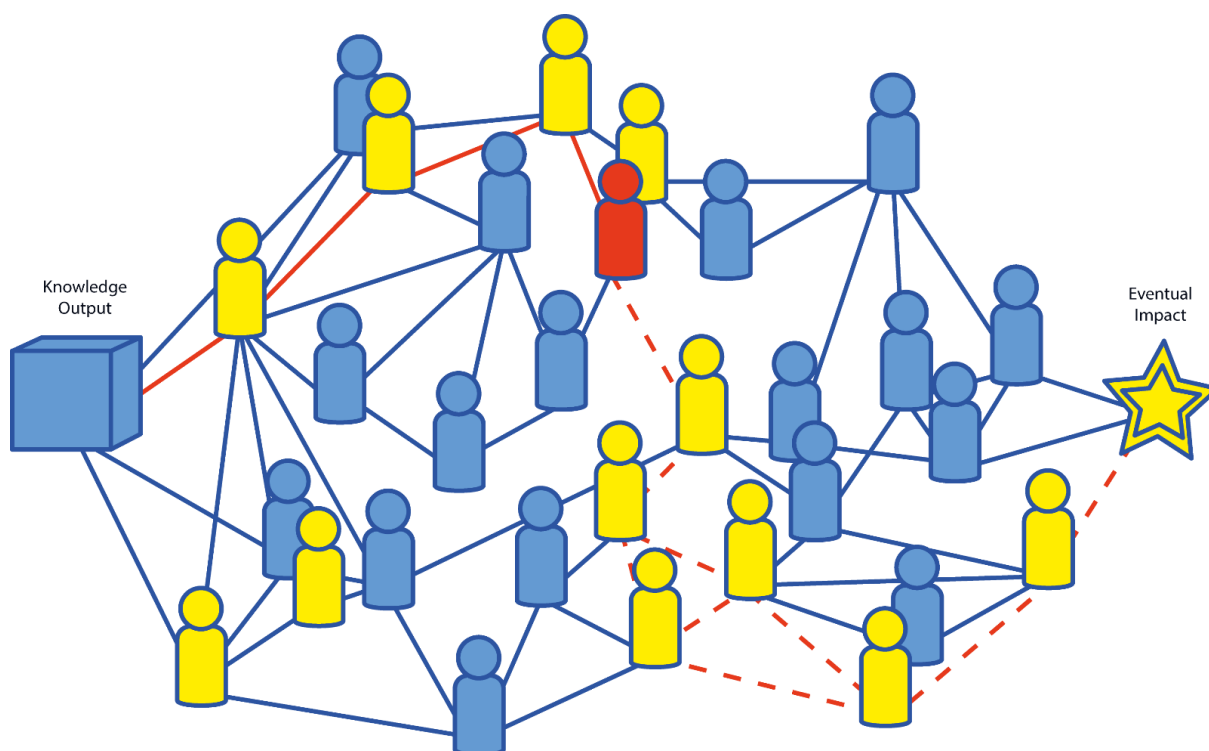


Fig.3 Visualizing a complex KOP (Source: COLUMBUS WP2: Methodology)

Further than gathering the information that Knowledge Fellows may need to trace the KOPs, a systematic approach to knowledge transfer makes it crucial to use flexible but also traceable means to register and organize the information we gather. Among the reasons why a systematic register or information is crucial, we can highlight the following:

- To be able to assess the process from a practical perspective and analyse what has worked best and worse, and in which context, and to learn from it. This is essential to deliver good case studies of successful and unsuccessful knowledge transfer and crucial, therefore, for the legacy of COLUMBUS.
- To allow transmitting the information about the process efficiently, particularly when the Knowledge Fellow needs to interact with other people in the process: the Competence Node Team, other partners in COLUMBUS, the Knowledge owners, etc.
- To allow measuring progress and achievements.

Apart from the use of COLUMBUS templates (accompanying the methodological approach for knowledge transfer described in D.2.2. “Guidelines on carrying out COLUMBUS Knowledge Transfer and Impact Measurement”) there are some other hints and tips which Knowledge Fellows are actually using to improve their performance at the analysis stage of the knowledge transfer process in this project. Among the most relevant, the following can be highlighted:

- The team-work approach to carry out the analysis is fundamental. The amount of information that needs to be gathered and synthesized, the different disciplines which may be relevant to understand a KO and its potential impact, and the network of experts and contact people that may be needed for identifying and profiling specific target users, may benefit hugely from a team-worked approach. In first instance, the Fellow will enrich his/her perspective about a KO



by using the internal expertise the institution in charge of his/her Competence Node holds. This capacity will be amplified with the Competence Node Team (formed by the competence node leader and other partners having declared expertise in the field). Ultimately with any other member of COLUMBUS network (Columbus partners, Columbus Advisory Board...) and with external experts in case needed, the Knowledge Fellow will have all the possibilities by hand to complete the information needed. Analysis meetings (remote or in-person) and a regular use of communication tools such as the e-mail, web and phone conferences and on-line repositories for documents' exchange, will be sufficient to support an efficient team-work approach.

- The use of graphic representations is especially recommendable to describe the Knowledge Output landscape and the KOP. The use of mindmapping tools (there are many easy-to-use and free-available solutions on internet) can be helpful, but any diagram structuring the relations between the elements you have in place and you need to consider within your Pathway may work. Following it is shown an example of how a landscape and a KOP can be graphically represented:

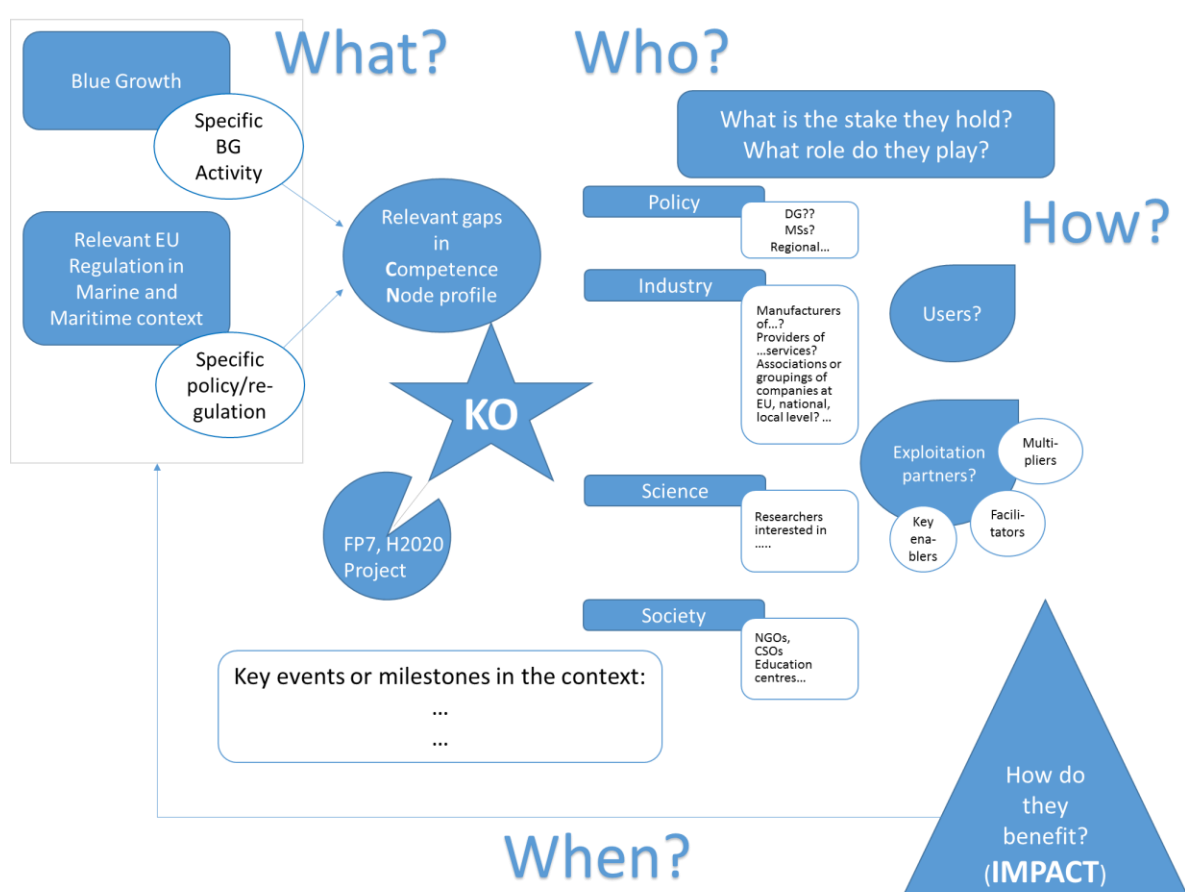


Fig.4 Landscape graphic representation





Gathering all the relevant information about a KO landscape will make it easier to determine who the individual target and end-users will be, what kind of actions may be needed to reach them and how to get their commitment to use the knowledge. This will also inform Knowledge Fellows to characterise impact (which is essential to determine the indicators that will be needed to measure this impact). Ultimately, this exercise will help the Knowledge Fellows to determine where to focus in order to more precisely identify individual target users, to determine the actions that will allow progression of the KO from the knowledge holder to these target and end users, and to foresee, in a more specific way than in any previous stage, what kind of impact can be achieved throughout the process. Then, this information will also be essential to determine when the eventual impact can be achieved and how costly the transfer process can be. This more focused and specific picture of COLUMBUS knowledge transfer process is the KOP. Its design should start by simply considering the different target users and the connections between them underpinned by transfer activities (fig.3), and once the best route for transfer has been determined, then we add information about specific transfer activities and about the progressive generation of impact until the application of knowledge by the end-user (Fig.2)

Target user profiling

In parallel to the design of the KOP it is necessary to progress in profiling the target users we identify during the process. The more we know about the individual agents we need to consider in our KOP (target users, end users and exploitation partners), the more effective our transfer actions will be. Then, profiling the target and end-users is essential to build an efficient Knowledge Transfer Plan. Again, the Knowledge Fellows need to gather information on a number of aspects such as:

- Who is the user and how do we envisage the user to utilize our Knowledge Output?
- What benefits will he/she get from using the Knowledge Output?
- How much does he/she know about the subject?
- Is he/she actively looking for a new knowledge or technology?
- How much can he/she decide to use the knowledge?
- Can you identify any conflict for the use of the knowledge by this user?

It may happen that answering some of these questions may take a lot of time and may be difficult, particularly if someone intends to do it alone. It can be easy to identify a potential user through a desktop research and searching on internet; but, can internet provide all that we need to know to profile and reach the user? The answer, in many cases, is 'No'. COLUMBUS has foreseen this matter and this is one of the reasons why the project was built as a big network of senior experts and expert institutions which can provide most (if not all) the support a Knowledge Fellow may need to do their job. The teamwork approach, as explained above in this section, is fundamental to succeed at this step.

Identifying the knowledge transfer activities

By considering all the information mentioned in the subsections above, it will be easier to identify suitable transfer actions we can use to reach the target users we have identified. With this, COLUMBUS contributes to building the best possible conditions to facilitate the utilization of knowledge and thus, the progress of the Knowledge Output down the KOP until it yields impact.

The Knowledge Fellows at this stage shall look at the information they have already and try to answer questions such as the following:



- Is the knowledge accessible for the users which have been identified and profiled? Do they know it?
- Is there sufficient and timely, and on a suitable mean and format, information about the KO to communicate about it? Is this information sufficiently understandable for the user(s)? How can we increase understanding?
- Can COLUMBUS do something to increase availability and understanding?
- Is the knowledge complete and ready for its application? Where? When?
- Have there been accomplished previous transfer efforts? What did work well and what not?
- Is it affordable to transfer the knowledge output within COLUMBUS?
- Is the knowledge protected? Does protection, in this context, make a difference?
- Which are the barriers for uptake? Is there a competitor knowledge in place? What are the advantages from the new one? Are those advantages quantified?
- Is there anyone who may help me in the transfer process? Who? How? Is this a facilitator, an enabler, a multiplier?

Answers to the questions above will help completing the KOP and our target user profiles. From this moment, we will have all the elements we need to decide to carry out the transfer activities or not, to explain the reasons for our decision, and to precisely and efficiently plan our transfer activities.

3 RESULTS AND MAIN FINDINGS

This Deliverable is being produced at the end of the first COLUMBUS Knowledge transfer cycle and refers to the period comprised from month 12 (Feb. 2016) to month 16 (June 2016), both included. This was originally planned for submission on month 16 (June 2016) but the short delay in the start of activities for WP5 (already reported in D.5.1.) and the extension of the first round of the collection process until month 13, made it necessary to assume this delay in order to get sufficient information. This meaning that the practical experiences of the Knowledge Fellows about the progression of knowledge through the analysis steps, has only been possible to assess by month 17.

Progress reported by Fellows by the end of month 16 consists in a total of 17 KOPs being developed, corresponding to a total of 31 KOs been prioritized to go through the analysis stage. Therefore, in some cases, the KOPs have been described for clustered KOs. Clustered KOs are those KOs which have clear complementarities and potential synergies if transferred together; they respond to a shared gap/need in the Competence Node and their shared analysis and transfer is expected to increase the opportunities for effective use and impact (compared to individual KOs' analysis). Clustered KOs are targeted for transfer to the same users (frequently providing complementary uses), through, normally, complementary knowledge transfer actions. There have already been reported some cases of the complete process of an output going from the collection to the analysis and then through a Knowledge Transfer Plan, even though just very few examples are available for this period. However, we know already that more than 60% of the KOP in progress at the moment of the elaboration of this Deliverable, reveal that it will be possible to move analysed knowledge to a transfer plan. However, it is expected that in many cases, the ultimate impact from Knowledge transfer to the end-user cannot be achieved within the time-frame of COLUMBUS. Progressing down the transfer pathway and approaching Knowledge to its users, is essential to guarantee that Eventual Impact (as defined in COLUMBUS) is achieved in the near future.





Apart from KOs going through the “standard” COLUMBUS transfer process, one of the competence nodes within COLUMBUS, the Marine Monitoring and Observation Competence Node has been exploring a slightly different approach to adapt to the specific opportunities available in the scope of this node.

Deliverable D4.2 ‘Portals and Repositories and their role in Knowledge Transfer to support Blue Growth’ highlighted the importance of data portals and repositories as sources of knowledge in the form of data, metadata and derived data-products and stressed that there is still a huge gap between the available knowledge that can be derived from European data resources and actual uptake by users resulting in tangible contributions to Blue Growth, marine environmental management and knowledge-based policy making. D4.2 also noted that there are significant data-gaps in the current marine observation data landscape and those projects, monitoring activities and the activities of industry or civil society may have potential to fill these data-gaps.

In order to develop case studies demonstrating real impact within the COLUMBUS project’s lifetime, Seascope, as Competence Node Leaders for Marine Monitoring and Observation and due to their experience with the EMODnet secretariat, proposed to take a targeted approach to the knowledge transfer activities, adapted to the specific opportunities available in the scope of this node.

In their approach they have identified three most common cases, or patterns of pathways this Competence Node will be approaching.

- Pattern 1: Pathways for transferring resources from repositories to users
- Pattern 2: Pathway for transferring data and resources from observation and monitoring activities to repositories (to fill in data gaps)
- Pattern 3: Transferring data and resources from observation and monitoring activities directly to users (focused on KOs identified with the regular COLUMBUS methodology)

From a WP5 perspective, information provided about progress under this approach, reveals that most of the effort carried out until month 16 has concentrated on Pathways that correspond to patterns 1 and 2. It is considered that this situation is consistent with the background of the Competence Node leader Seascope, and the CN team organizations. These partners, and particularly the CN Leader, are in the best condition for having deeply learnt from the experience of the EMODnet initiative and take advantage of it to fast track opportunities for knowledge transfer in this context. Information reported for specific cases of knowledge transfer under progress, reveal that even the starting point for transfer may be different from that for other nodes, the analysis stage is carried out similarly and it could be worthwhile to adapt the information, at least for the most promising cases of transfer, to COLUMBUS templates. This would contribute to validate how adaptive the proposed approach for COLUMBUS can be.

Following it is provided an example from information extracted from an internal report by the Competence Node:

EMODnet Physics Data (pattern 1)

Projects such as the FP7 CALYPSO project have been making available HF radar data to EMODnet Physics. These data provide information on surface currents in the coastal ocean (direction and speed). Discussions with EMODnet Physics coordinator, Seascope and EuroGOOS highlighted the application of these data for recreational users of the sea in Portugal, where intermediary companies have developed a service making these data available as visualised



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products on television screens in coastal hotels. Seascope and EuroGOOS are working to establish if there is a potential for a case study exploring the use of these data to support recreational users of the sea (in other areas) e.g. the Flemish or Irish coast.

Potential Impact: Service providers would use EMODnet physics data to provide a new service in a coastal area.

This summary highlights the following:

- A relevant FP7 project was identified: CALYPSO.
- A promising Knowledge Output (given the expertise of EMODNet participants and their knowledge about the needs on data and data repositories in the marine context) was prioritised: the HF radar data on surface currents in coastal ocean (direction and speed).
- A team-work approach has been used to assess the potential impact and application of the KO with this, information has been gathered on a previous experience of application (the case of Portugal) and current work is devoted to explore potential for the expansion of this (recreational) use to other areas. This information is relevant to describe the KO landscape and reveals the potential use of this KO.
- Current efforts to explore opportunities for similar applications and transfer in other countries could add substantial ideas of potential target and end-users and about potential impact. Therefore, progress in this context would allow the Knowledge Fellow to draw the Knowledge Output Pathway and assess the possibilities to prioritize this KO to a Knowledge Transfer Plan.

Factors influencing the quality and quantity of progress of KOs through the transfer process from an external and internal and perspective

The following findings come from both, the observation of KOTs and KOPs prepared by each CN and a survey addressed to Knowledge Fellows in June 2016 (carried out by CETMAR as WP5 leader):

External factors (factors not directly controlled by COLUMBUS partnership)

The factors below should be considered preliminary as more cases of analysis will need to be carried out to extract more robust conclusions. The different characteristics of the context of each Competence Node may have an influence on the kind of transfer processes carried out and on overall progress and achievements: The nature of the competence nodes influences the specific kinds of knowledge transfer that may take place.

- Sectoral Competence Nodes (aquaculture, maritime transport, fisheries, marine biological resources and marine physical resources) are more likely to focus their efforts on science-industry transfer. In this context, the more technological an Output is, the more chances for it to be prioritized for transfer. With the exception of maritime transport and logistics, all the above sectors are productive sectors (with activities in the core of their value chains in the primary and tertiary sectors). Maritime transport and logistics can be considered to be a service sector with a strong industrial value chain behind. Despite focussing on potential science-industry transfer not all the CNs are finding that the majority of KOs they can analyse are applicable to such transfer. As of now, only CNs on Marine Physical Resources and on Maritime transport have found industry to be the principal field of application.
- Until now, it has been difficult for COLUMBUS to identify projects and KOs with special relevance for the Coastal Tourism Competence Node, despite of its sectoral orientation. It could be happening that the KOs relevant for application in this context are disperse (not that



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much concentrated on targeted projects) and that, due to this, relevant information for the Tourism CN is being handled by other CNs in COLUMBUS. The project will need to look at this possibility and find a possible solution to guarantee a proper analysis and transfer of Knowledge in this field.

- Crosscutting CNs: 1) Marine Governance and Management 2) Marine Environment and Futures and 3) Marine Monitoring and Observation. CN 1) is more likely to focus on science-policy transfer. Many of the KOs identified are oriented to inform decision support and policy design within a varied kind of formats and displays. However, in the value chain of governance, the private sector is also an actor. There are many areas where private companies (and research centres) provide their services to administrations at different levels. By considering this it will be possible to explore complementary or alternative routes with different knowledge transfer approaches in this context. In fact, the first Knowledge Transfer Plan set in place by this node (NEAT-DEVOTES reported in D.5.1) has been applied as a science-industry transfer. CN 2) has not sufficiently evolved through the analysis stage at the time of the elaboration of this report and it is difficult to extract conclusions. The situation for CN3) has already been explained and it could become one of the CNs with a higher diversity of knowledge transfer types addressed (regarding the field of Knowledge application).
- Science-to-society oriented KOs have been identified as most frequent options for transfer in a number of the Competence Nodes (tourism, marine environment and futures, fisheries and as a second most probable option for transfer in two additional CNs). Science-to-society transfer pathways may become a challenging option for COLUMBUS as only in recent years this kind of transfer approach has been paid special attention. Various members of COLUMBUS network have experience in this field and may provide fellows with valuable inputs to successfully carry out transfer activities in this context. It may be needed to provide special support from the project Coordination team to generate significant impact under this transfer approach.

Internal factors (factors directly controlled by COLUMBUS partnership)

The following three main factors are considered relevant to explain the situation of progress achieved from an internal perspective:

- Despite the significant effort made to explain the methodology, to make it flexible and adaptive and to train those more directly involved in its application, there are yet some barriers/difficulties in this field: difficulties to get a completely shared understanding of the methodology concepts; the difficulties to apply the methodology systematically; the need to support the methodology implementation and evolution with different tools (which do not facilitate sufficiently the automation of the reporting process), etc. As a contingency measure, during the 4th COLUMBUS partner meeting which took place at CETMAR premises (in Vigo, Spain) in July 2016, practical and parallel workshop sessions were organised to carry out a collective analysis of KOs and clarify any remaining misunderstanding about the methodology. The outcome of this was that there was a significant improvement in the shared understanding and confidence in using the method.
- The project progress has revealed some possible shortcomings or under-considered issues in the project planning which may have lead the interpretation of achievements to a situation of underperformance while it is not really the case. The three Knowledge Transfer Cycles planned in COLUMBUS Description of Action did not sufficiently emphasize that to achieve significant progress with the analysis, it would be first need to have a significant and relevant knowledge base assigned for each Competence Node. This for each of the CNs to explore Knowledge



available and prioritize most promising KOs to carry out the analysis and then to transfer those KOs with higher potential for impact. This means that during the first cycle of the process, most of the efforts and outcomes (in quantity) relate to Knowledge Collection. The analysis process could start in parallel to collection as it happened, but yet the number of KOs analysed is not sufficiently high, and there still has been few chances for real transfer actions. It is foreseen that in the second cycle, collection will only add an update of projects but most part of the Universe of projects for COLUMBUS may have been explored already. During the second cycle, analysis is expected to yield much of its fruits and transfer opportunities will increase proportionally, as far as the progress with the analysis provides sufficient material to identify interesting chances for KT and impact.

WPs/Transfer Cycles		1 st round (M7-M18)	2 nd round (M14-M24)	3 rd round (M20-M30)
Collection (Wp4)	P			
	R	XXXXXXXXXX	XXXX	X
Analysis (WP5)	P			
	R	XXXXXX	XXXXXXXXXXXX	XXXX
Transfer (WP6)	P			
	R		X X X X	XXXXXXXXXXXX

Table 1. Representation of knowledge transfer cycles, difference on efforts needed in each cycle per WP. P=planned; R=Real

- Insufficient use of the team approach has been identified as a major recommendation to speed-up progress from KOs collection to Knowledge transfer (only in one of the CNs , Knowledge Fellows have used CN teams as something to be done ‘always’ for the analysis; another 4 recognise they have needed to use the network approach at some moment and 3 others has not used the CN network yet). COLUMBUS has been designed as an extensive network to guarantee sufficient expertise is available within the network to provide support at any stage of the knowledge transfer process:
 - the network approach has provided valuable advice and information to determine the key strategies to be considered for mapping the knowledge demand in WP3
 - it has the capacity to support Knowledge Fellows in the Collection process to confirm the relevance of a project and/or the potential of a KO, and even to link and get the engagement of a Project Coordinator/Knowledge holder
 - it can provide valuable information for the analysis from the landscape characterization to the identification of individual target and end users, etc.

Knowledge Fellows have identified among the more challenging components of the analysis process in COLUMBUS, the “identification of key events and milestones in the sector of application of a KO”, the “profiling of individual users” and the “identification of transfer actions”. Using COLUMBUS network to address these challenging aspects is one of the major recommendations made to Knowledge Fellows by the project’s Coordination and Management Team. One of the measures undertaken to facilitate overcoming this matter has been the organization of practical workshop sessions carried out to put this idea into practice during the accomplishment of the 4th partner meeting (July 2016). Fellows had the chance to improve under progress KTPs, to identify and profile target and end users and to validate and complement ideas about potential KT activities needed. Moreover, it was assessed and key advice has been provided on how the team work approach could and should be more often





set in place by using the networking tools already in place in the project (internet conferences, basecamp, dropbox, etc.) Besides the reinforcement of training, the project management team, will analyse this matter and propose additional measures to overcome this matter and assure a fluent application of COLUMBUS methodology during Knowledge Transfer Cycle 2.

Consolidating COLUMBUS network, and the sub-networks around Competence Nodes, as a fluent and virtuous space to support the different steps of the transfer processes lead by Knowledge Fellows, and normalising the application of COLUMBUS methodology as a basic standard approach for the project, constitute the two major challenge for the second Knowledge Transfer Cycle. This will increase the efficiency of the Knowledge analysis and the chances for successful Knowledge Transfer. The basis to achieve those challenges are already setup because of work carried out in the period reported in this deliverable.

4 CONCLUSIONS

1. The analysis process as planned in COLUMBUS has been demonstrated adequate as a previous step to generating an efficient Knowledge Transfer Plan as it informs about the principal elements that will be necessary for planning transfer.
2. COLUMBUS methodology has evolved and will continue evolving as a result of lessons learnt from implementation but it has shown already that it is sufficiently adaptive. Notwithstanding, some barriers for its application and understanding need an additional effort by CN members to become fully overcome.
3. Although three complete knowledge transfer cycles have been planned, most significant progress of first cycle will be related to collection of knowledge (WP5) while first, analysis and after that, transfer results will become progressively more predominant as second and third transfer cycles are implemented.
4. COLUMBUS network is yet being underutilized. The project will need to address some more contingency measures maximize the exploitation of the network full potential.
5. COLUMBUS will accomplish different types of Knowledge Transfer through case studies: science-to-science; science-to-policy; science-to-industry and science-to-society. It is expected that the majority of COLUMBUS Case Studies focus on science-to-policy and science-to-industry. Science-to-science is probably the only suitable approach for many of the collected KOs but as this kind of transfer occurs systematically (within the academic sphere) COLUMBUS will support this type of transfer process when additional value is clearly identified and action from COLUMBUS serve to speed up knowledge spread and the adoption of transdisciplinary approaches, if focused on future knowledge application. Finally, science-to-society is a challenging field of work for COLUMBUS. The project needs to envisage some actions to implement efficient approaches in this less traditional approach to knowledge transfer.



REFERENCES

- COLUMBUS Grant Agreement. Annex I Description of Action.
- COLUMBUS Deliverable 2.2. “Knowledge Guidelines on carrying out COLUMBUS Knowledge Transfer and Impact Measurement”
- COLUMBUS Deliverable 5.1 “Knowledge Output Analysis including Knowledge Output Pathway Generation and Results”
- COLUMBUS Deliverable 4.2. “Portals and repositories and their role in Knowledge Transfer to support Blue Growth”

