DELIVERABLE DT2.1.1

Snowball Mechanism for Downstreaming
Capacity Building of PP/AP/Exertnal BSOs

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1. Introduction

1.1 Overview of the deliverable D.T2.1.1

Boost4BSO deliverable number D.T2.1.1 is titled in the application form as 'Snowball-mechanism for downstreaming capacity building of PP/AP/external BSOs'. Deliverable description states that 'PPs, guided by FH OÖ, will define a mechanism of scaling up BSO capacity building in whole CE, starting with PP BSOs (wave 1), followed by Aps and external (i.e. not participating in this project) BSOs (wave 2) and supposed to be continued analogous to the snowball effect.'

In detail, a 'snowball mechanism' for downstreaming of BSO capacity building is meant to assure knowledge distribution across a layered network of collaborating units. These units include Business Supporting Organizations (BSOs), companies (specifically SMEs) and other institutions that are capable and willing to provide knowledge. The process of downstreaming is divided into gradual steps as defined in the application form – labeled Wave 1, Wave 2, and Wave 3:

> **Wave 1:** Involvement of PP BSOs
>
> **Wave 2:** Involvement of APs and external BSOs (not participants of this project)
>
> **Wave 3:** Involvement of other partners in extended partner networks

Industry 4.0 (i.e. I4.0) presents unique challenges and raises new market demands. It is critical to assure that market actors that do not possess large & scalable innovation capacities - i.e. SMEs - have access to essential information that sustains and promotes their respective market presence. Interreg CE is interested in fostering an environment that enables BSOs to communicate and effectively educate SMEs in the CE region on topics pertaining to I4.0. BSOs already operate in respective markets and possess vast amounts of knowledge in the relevant industries. Furthermore, PP BSOs were involved in Interreg CE projects and other projects that tie back to the topics of I4.0 – making them ideal knowledge disseminators in the scope of Wave 1. Combining different international/regional presence of PP BSOs with their specific previous projects experience and their involvement in a variety of industrial sectors is meant to assure a solid and promising starting point for knowledge sharing.

Design of an effective model that enables BSOs to scale up their capacities needs to reflect fundaments of knowledge sharing.

- First, the object of sharing needs to be examined in the transactional context – What is its purpose and value. See Chapter 2.

- Second, the parties involved in the knowledge transfer need to be identified and their participation needs to be justified – Who are the participating entities and why do they choose to collaborate. See Chapter 3 & Chapter 4.

- At last, the object of sharing and the participating parties need to be provided with a system that considers the nature of the object and the physicality of the transaction – What is it exactly that needs to be transferred and what is the most optimal mode of knowledge sharing among multiple parties. See Chapter 5.

1.2 Arguments for collaborating internationally

Sometimes potential information and knowledge providers (IKPs) are not willing to share their experience and knowledge with others because they fear competition. Practical experience shows that the strength of this aversion against knowledge sharing depends heavily on the domain and the geographically location of the potential information seeker (IS). Principally the following trends could be identified:

- It is easier to share information with information seekers from other domains as they are less likely competitors. E.g. transferring knowledge from pharmaceutical production to automotive would not endanger one's own position.

- It is easier to share information with information seekers from other geographical regions. For example, a SME covering only a limited regional market will find no problem in helping a similar SME in another region, if their market does not overlap.

- A different cultural background may have an impact on how to tackle problems. Therefore collaborating with information providers from other regions might stimulate creativity and strength the solution competence.

- Although for research and educational institutions, international collaborations might be easier because these collaborations might not compete for the same national funding budgets.

All these arguments are motivators for an inter-regionally and internationally cooperation of all network partners. It is in the responsibility of the BSO to consider potential domain specific or regional obstacles in the cooperation and to propose adequate, not conflicting project members.

2. Fundaments of capacity building – understanding the role of knowledge, skills, competences

2.1 Overview of scientific literature regarding knowledge, skills, and competences

'Snowball mechanism' assumes that transferability of knowledge is attainable and can be replicated – even without the participation of the original provider in the following transfers. In the context of Boost4BSO this means that particular experience -such as previous involvement in a project related to the topics of Industry 4.0 can be broken down to (semi-independent) learning points and acquired by new BSOs (and/or other companies and institutions) for the purposes of further dissemination. The continuous acquisition of these 'objects of sharing' and their exchange with new entities outside of the current network ensures rapid (i.e. exponential) growth of Industry 4.0 capacities across SMEs in the CE region – akin to a snowball rolling down the hill and growing at an increasing pace.

'Object of sharing' therefore needs to be defined and understood to maximize the potential capacity building across envisioned Waves of Dissemination (WoD). Scientific literature on the subject provides an insight into specific fundaments of such objects.

European Centre for the Development of Vocational Training published 'Typology of knowledge, skills and competences: Clarification of the concept and prototype' in 2006. This publication includes helpful classification of knowledge that views it as a component of a larger concept – 'competence'.

Figure 1: Typology of Knowledge, Skills and Competences

Unified typology of KSCs

	occupational	personal
conceptual	cognitive competence (knowledge)	meta-competence (facilitating learning)
operational	functional competence (skills)	social competence (attitudes and behaviours)

(Winterton et al., 2006, p. 60)

As described in the Figure 1 by the European Centre for the Development of Vocational Training 'knowledge' represents only a portion of one's expertise and its nature requires other components of competence for its full utilization. BSOs and any other entities involved in the exchange of knowledge therefore require 'learning capacities', 'skills', and 'attitudes & behaviors' to achieve status of a topic expert.

- **Knowledge** (i.e. cognitive competence) represents a theoretical manifestation of one's experience. Involvement in an Industry 4.0 project/topic provides entities with immediate experience that is transformed into knowledge.

- **Learning capacities** are a prerequisite of effective participation in the knowledge exchange and their acquisition. It is the assumption that participating parties in the Industry 4.0 knowledge exchange already attained capacities that enable them to receive, process and learn from new information.

- **Skills** (i.e. functional competence) are a practical manifestation of one's experience. Acquisition of skills is gradual and is directly tied to performing relevant tasks. Skills can be partially acquired in the process of knowledge exchange -accounting for proportional exposure to respective Industry 4.0 topics.

- **Attitudes & behaviors** are general stances towards topics of Industry 4.0 as well as stances towards knowledge exchange on both – giving and receiving ends. The main factor that influences 'Attitudes & Behaviors' is <u>motivation to participate in the knowledge exchange</u>.

Similar philosophy and classifications are mirrored in other scientific literature, such as Baartman & de Bruijn's paper 'Integrating knowledge, skills and attitudes: Conceptualising learning processes towards vocational competence.' Published in Educational Research Review in 2011. Figure 2 below depicts their concept of acquiring professional competence (i.e. becoming an expert at a given topic).

Figure 2: Elements of competence
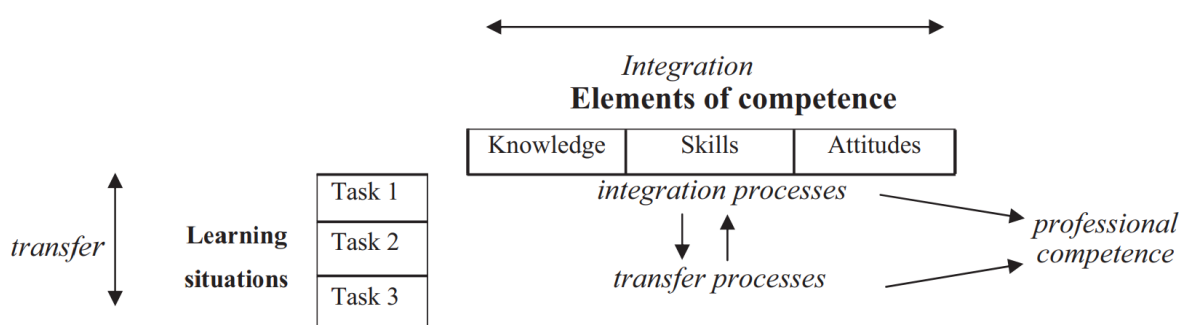
(Baartman & de Bruijn, 2011, p. 128)

The concept assumes that performing a multitude of tasks enables consequent and gradual transfer of knowledge as each task provides a learning experience. If the learning process is matched by integration of 'Knowledge', 'Skills' and 'Attitudes' i.e. simultaneous compatibility among these competence elements – then it is possible to acquire 'professional competence'. An Industry 4.0 expert therefore needs multiple competences (or elements of competence) and their positive alignment.

Practical examples of elements of competence –i.e. 'Knowledge', 'Skills' and 'Attitudes' can be examined for their fit in the design philosophy of the capacity building. The following examples were identified and considered for the purpose of downstreaming of capacity building:

- **Practical examples of knowledge elements** : Reports, White papers, Lecture notes, References to use cases, success stories, best practice, Literature, References to experts, References to other "information seekers" / peers, Multimedia resources, etc.

- **Practical examples of skill elements:** Practical trainings, Field trips, Seminars, Peer2Peer sessions, Lab & workshop sessions, Virtual training tools, Brainstorming, Round table sessions, etc.

- **Practical examples of attitude elements**: I4.0 affinity, Open mind to new technologies, Willingness to change own behavior, Willingness to share, Willingness to learn, etc.

'The object of sharing' can possess a multitude of different forms. Wijnhoven's 2003 paper 'Operational knowledge management: Identification of knowledge objects, operation methods, and goals and means for the support function.' tackles the different forms in detail. Referring to them as 'Knowledge objects' Wijnhoven lists knowledge object categories by their storage media and provides examples for each category. See Figure 3 below.

Figure 3: Knowledge objects

Storage media	Knowledge objects
Individual	Professional skills; evaluation criteria and results; explanation of procedures, decision rules; personal ethics and beliefs, performance criteria; individual routines
Culture	Schemes; stories; external communications; cultural routines
Transformation	Tasks; experiences; rules, procedures and technology; patents
Structure	Task divisions; hierarchy; social structure; formal structure; communication structure
Ecology	Layout of work place; building architecture
External	Client and market characteristics; competition profiles; list of knowledgeable people and organisations; technology of competitors
Systems	Planning and decision systems; process control systems; GroupWare, computer aided design systems, knowledge-based systems; administrative systems

(Wijnhoven, 2003, p. 198)

The knowledge object form needs to be considered in the design of the snowball mechanism as there are format limitations pertaining to practical knowledge exchange.

2.2 Key insights on knowledge - summary for Boost4BSO capacity building

With regard to the design of snowball-mechanism for downstreaming capacity building there are several key take-aways from the scientific literature about the 'object of sharing':

- Knowledge is only one portion of competence acquisition.
- Other competences/elements of competence (e.g. skills, attitudes & behaviors) are essential for the effective acquisition of expertise.
- The objects that are shared within the knowledge transfer have a multitude of forms that need to be compatible with the format of the knowledge exchange.

3. Stakeholders, entities and roles in knowledge exchange and capacity building

3.1 Stakeholder types

This chapter section lists the main actors in an I4.0 empowering network. Detailed look onto stakeholders provides insights for design considerations of the downstreaming of the capacity building.

A. Information seekers

Needing or seeking additional knowledge in order to improve their competitiveness.

A.1 Information Lacking Companies (ILC)

> Information Lacking Companies are companies that are not aware that they lose competitive strength because of missing technological competence.

> Most companies of this type will be found among Small and Medium Companies (SMEs), as they often work on their capacity limits and have no explicit budget for R&D.

A.2 Information Seeking Companies (ISC)

> Information Seeking Companies are aware of their technological situation. They are already interested in I4.0 and are actively trying to build up missing expertise. ISCs might actively contact BSOs in order to get support.

B. Information providers

Optionally detect a lack of knowledge or competences (mainly for ILCs), identify adequate information and knowledge providers and spreads this information to ISCs and ILCs.

Makes ILCs aware of their situation and tries to convert them into ISCs.

B.1 Business Support Organisation (BSO)

> Business Support Organisations are usually public bodies that support companies to stay competitive. Usually they focus on supporting SMEs.

B.2 Educational Organisations (EDU)

> Public and private organisations that provide educational services like universities, schools, training centres.

B.3 Research Organisations (RES)

> Public or private research organisations without educational services.

B.4 Reference Companies (RCs)

> Companies that already have a high level of expertise in one or more addressed topics and are willing to share their experience with others.

> Usually RCs are larger companies, but can also be some small specialists.

B.5 Scientific and industrial conferences (CONF)

> Give insight into future trends.

B.6 Trade fairs (FAIRS)

Give insight into the industrial state of the art.

B.7 Publications (PUBL)

Research papers, best practice examples.

3.2 Roles in the context of knowledge exchange for capacity building

The relationship between two parties exchanging information requires a definition of roles that is acquired in the scope of a knowledge transaction.

- **Knowledge seeker** is a party that is interested in the acquisition of knowledge. In the context of Boost4BSO project the knowledge seeker is a unit that experiences a need for knowledge in the realm of Industry4.0 and is interested in communicating this need to another party.

- **Knowledge provider** is a party that is capable and willing to share its knowledge with other entities – be it other knowledge providers or knowledge seekers themselves. In the context of Boost4BSO the knowledge provider is a unit with valuable Industry 4.0 knowledge that is motivated to pass this knowledge to knowledge seekers.

Knowledge seeker and knowledge provider are roles that pertain to an isolated knowledge transaction and in practice the involved parties can swap roles and/or hold both roles simultaneously.

Boost4BSO project responds to needs of SMEs in the CE region with regard to knowledge about Industry 4.0, i.e. there is a market need that generates knowledge seekers. The transaction of knowledge requires a knowledge provider for its completion. The prerequisite of a functioning system of knowledge downstreaming therefore relies on knowledge providers that are <u>motivated</u> to participate in the transfer.

Motivation for participation in the knowledge exchange ties back to the section 2.1 (Overview of scientific literature regarding knowledge, skills, and competences) of this report. It was previously established that 'Attitudes & Behaviors' are a critical component of knowledge exchange and the effective acquisition of professional expertise. Relationship between motivation and knowledge transfer is described in von Krogh's 1998 paper titled 'Care in Knowledge Creation'. Paper uses the term 'care' to express individual and social motivation to participate in the knowledge exchange.

Social dimension of this model labels low 'care' knowledge exchange as 'transacting' and high 'care' knowledge exchange as 'indwelling'. The key difference between 'transacting' and 'indwelling' is knowledge provider's interest and involvement in the communication process. Indwelled knowledge is knowledge that is examinable by the knowledge provider and confirmed to be valid. Figure 4 depicts the generalized idea behind different effects of 'care' on the knowledge transfer.

Figure 4: Effects of 'Care' (motivation) on Knowledge creation & exchange
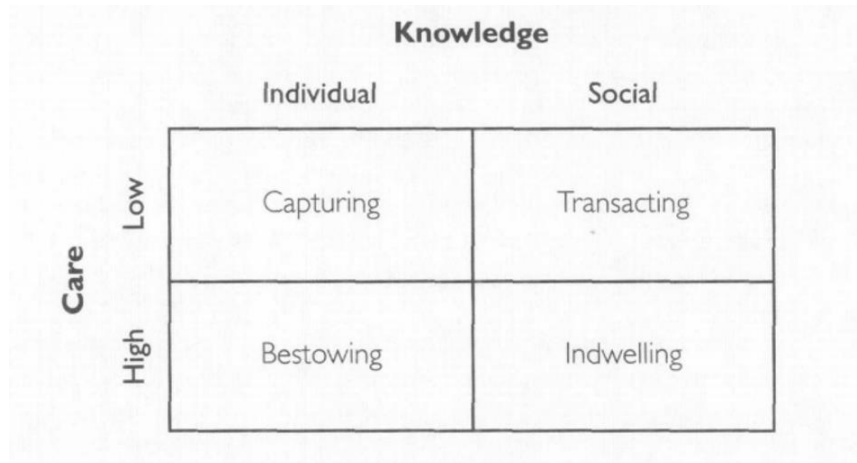
(von Krogh, 1998, p. 139)

3.3 Key insights on stakeholders & roles - summary for Boost4BSO capacity building

Following key insights on stakeholder, entities and roles in knowledge exchange and capacity building were identified:

- Only a company that is aware of its lack of knowledge is an eligible participant of the capacity building

- The importance of motivation – specifically for providers of knowledge - cannot be overstated. Knowledge exchange stands and falls on knowledge provider's motivation.

4. Current State of BSO Networks and Information Flow (Status Analysis)

4.1 Methodology of status analysis

Scientific literature on the subject of inter-organizational knowledge exchange does not suffice for the purposes of designing a downstreaming capacity building model for PPs, APs and external BSOs. Thus, survey was conducted by PP FHOÖ which aimed to collect information from the participating Boost4BSO project partners on topics of <u>motivators for knowledge exchange and understanding of the partners' general business environment</u>.

Contents of the survey 'Motivators For Knowledge Sharing Status Analysis' collected information from the 7 Boost4BSO project partners in the following categories:

Motivators:

- **Key motivators for knowledge sharing** – describing specific and critical motivations driving the exchange of knowledge.

Business environment:

- **Business sector(s) specialization** – describing one's field of operation. Sectors that are not competing can incentivize inter-sectorial knowledge sharing.

- **Regional sources of knowledge** – in scenarios when BSO is in the role of a knowledge seeker where do they seek the knowledge.

- **Cooperating EDUs information** – what is the role of educational institutions in the current structure of knowledge exchange.

- **BSO partners information** – what is the current status of the partners' networks, is there isolation/interconnection.

- **Reference companies/contacts information** – what are the best practice/most valuable examples of partnered units that are used as a point of reference for a specific case.

- **Trade fair participation (optional)** – is there an external platform where partners already exchange Industry 4.0 topics.

Motivators for knowledge exchange can be classified across several categories. There is a vertical dimension that reflects the flow of knowledge from a knowledge provider to a knowledge seeker. Knowledge is shared down vertically from the provider to the seeker. Figure 5 illustrates the vertical dimension of motivators for knowledge exchange and pertaining transformation of members' inputs (expanding knowledge base, improving internal capabilities) and outputs (using new knowledge to reach new targets).

Figure 5: Vertical dimension of motivators for knowledge exchange

A.1. Input transformation

A.2. Output transformation
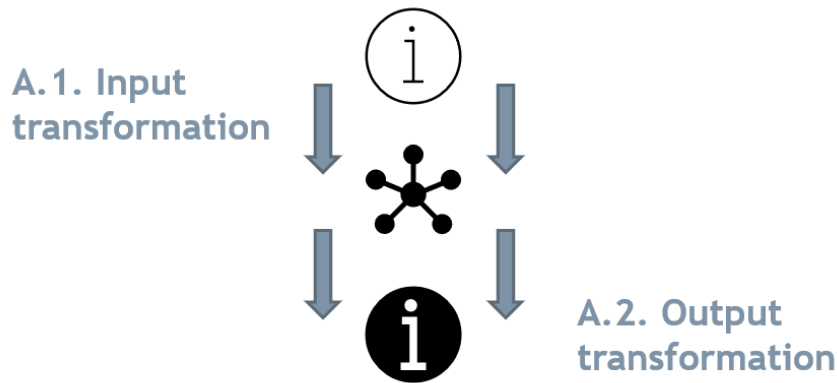
Apart from the vertical dimension of motivators for knowledge exchange there are motivators that transform relationships among information providers themselves – horizontal dimension. Knowledge is shared within a group and it is also used as a competitive leverage against non-members. Figure 6 below illustrates horizontal motivators for knowledge exchange and pertaining collaborative transformation (connecting with other entities for future opportunities) & competitive transformation (distinguishing oneself in an external perspective).

Figure 6: Horizontal dimension of motivators for knowledge exchange

B.1. Collaborative transformation

B.2. Competitive transformation
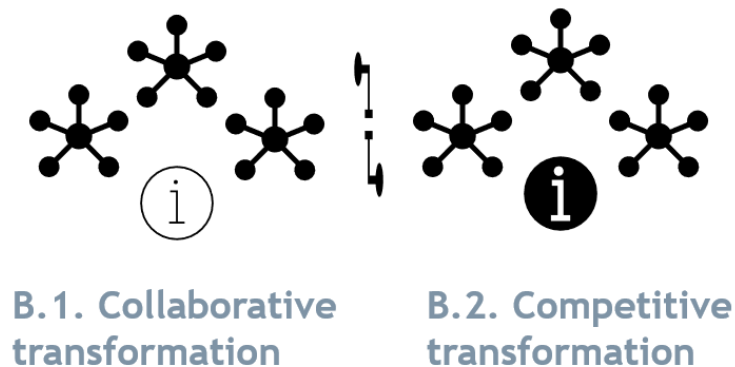
4.2 Results of status analysis – What motivates BSOs to participate in knowledge exchange?

Further granularity of categorization for individual motivators can be attained by examining the survey results. Boost4BSO project partners provided filled out 'Motivators For Knowledge Sharing Status Analysis' surveys that were examined and scanned for recurring themes in knowledge exchange motivators. Figure 7 displays extrapolated motivators for knowledge exchange as provided by PPs. Only motivators that were mentioned by at least 2 project partners were displayed in this table. Motivators were ordered in a descending fashion – starting from motivators with highest frequency of occurrence (as mentioned by PPs) on top. '1's in the table reflect the listed motivator as mentioned by the respective PP. 'sum' column expresses the number of PPs who mentioned the respective motivator. Color-coding represents different

forms of transformation categories; input transformation - blue, output transformation – red, collaborative transformation – green, competitive transformation – yellow/orange. See Figure 7 below.

Figure 7: Key motivators for knowledge sharing – survey analysis results

Key motivators for knowledge sharing	AVO	Biz-Up	CMAB	FINN	MESAP	SAAM	STEP RI	sum*
experience/best practice exchange	1	1		1	1	1		5
networking	1		1		1	1	1	5
new projects	1	1		1			1	4
new services			1	1	1		1	4
boost internal competences					1	1	1	3
new products	1	1	1					3
competitiveness				1	1		1	3
visibility/reputation				1	1		1	3
new clients	1						1	2
new processes				1		1		2
keeping up with current trends		1		1				2
Color code								
input transformation	expanding knowledge base, improving internal capabilities							
output transformation	using new knowledge to reach new targets							
collaborative transformation	connecting with other entities for future opportunities							
competitive transformation	distinguishing oneself in external perspective							

*motivators ordered by frequency of occurence

Data gathered in the scope of the 'Motivators For Knowledge Sharing Status Analysis' enable categorization model to include specific motivators in their respective category. Overview of the vertical & horizontal level of motivators for knowledge exchange follows this structure:

A. Vertical Level

    A.1. Input transformation

        A.1.1. Sharing experiences & Best practice exchange

        A.1.2. Boosting internal competences

        A.1.3. Keeping up with current trends

    A.2. Output transformation

        A.2.1. New projects

        A.2.2. New services

        A.2.3. New products

        A.2.4. New clients

        A.2.5. New processes

    B. Horizontal level

        B.1. Collaborative transformation

            B.1.1. Networking

B.2. Competitive transformation

B.2.1. Competitiveness

B.2.2. Visibility & Reputation

The highest ranked motivators for knowledge sharing among BSOs according to the survey analysis results were 'experience & best practice exchange' and 'networking'. Findings regarding the key motivators for knowledge sharing were assessed in relation to BSO business environment.

Competitive environment represents a challenge for knowledge sharing. If a particular piece of knowledge can provide the participating knowledge provider with a competitive edge in their sphere of operation, they are being disincentivized from participating in the knowledge exchange. Furthermore, motivators such as 'competitiveness' and 'visibility/reputation' were listed by PPs and confirm the design assumption that competitive transformation is a relevant factor in knowledge sharing. Knowledge access exclusivity needs to be accounted for in the design of the downstreaming mechanism for BSO capacity building.

Analysis of the BSO business environment through a lens of self-reported motivators for knowledge sharing indicates two possibilities for circumventing the compromise of the competitive advantage of participating knowledge providers. These possibilities are:

- Sharing knowledge across different non-competing business sectors (e.g. applicable I4.0 knowledge in the automotive industry and food industry)

- Sharing knowledge across different non-competing geographical regions (e.g. regionally bound BSOs & companies that require I4.0 knowledge but do not share the same markets)

Interoperability of knowledge applied from one competitively unrelated business sector to another requires a case by case approach. In these instances, the best judges for a meaningful knowledge transfer are knowledge owners with large scale access to information from different sectors. BSOs that operate in several non-competing business sectors are prime examples for deciders of inter-sectorial knowledge transfers. The individualistic nature of SMEs' I4.0 knowledge needs is a key design principle behind the capacity building of BSOs, APs and other participants.

The BSO business environment analysis provides sufficient data to visualize envisioned geographical accommodation of knowledge access exclusivity. The survey asked Boost4BSO PPs to list their partners and the collected data was used for a graphical representation of current PP networks. The idea behind this visualization was to illustrate geographical possibilities for non-competitive knowledge sharing. Images of CMAB and SAAM as well as image of the combined PP network were chosen to visualize the dissemination potential. Figure 8 below showcases the partner network of PP CMAB as an example for PP network that spans multiple countries and provides plentiful and varied experience for the PP to consider for knowledge transfers.
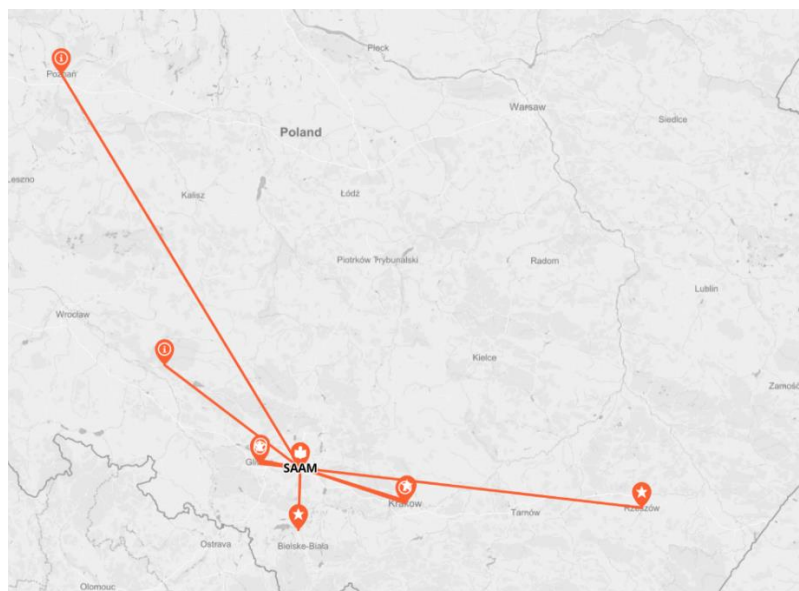
Figure 8 – CMAB partner network visualization
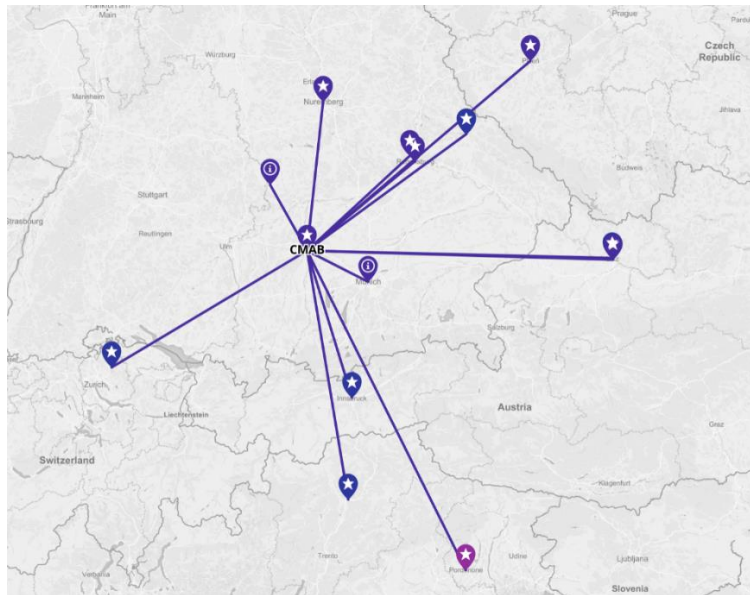
On the other side of the spectrum Figure 9 shows the case of PP SAAM partner network that serves as an example of focused and specialized experience in the geographical region of Poland. This network configuration trades relative geographical variety for depth of expertise in the pertaining region.

Figure 9 – SAAM partner network visualization

Visualizing every PPs' partner network together provides an illustration of extended WoD potential. Figure 10 is the combined network of all PPs that can serve as a base of knowledge distribution throughout the knowledge transfer iterations of the snowball mechanism for capacity building.

Figure 10 – Combined PPs network (Snowball mechanism potential)

4.3 Key insights on motivators - summary for Boost4BSO capacity building

Several critical insights regarding Motivators were discovered in the scope of the status analysis that need to be considered in the design of the snowball mechanism for downstreaming of capacity building. These insights are:

- The most common listed motivators for knowledge exchange are 'experience & best practice exchange' and 'networking'.

- Knowledge access exclusivity is desirable and inhibition of knowledge exchange can be circumvented by cross-sectorial (i.e. cross-domain) and inter-regional collaboration

5. Scaling Up Capacity Buidling for BSOs – Boost4BSO Knowledge Sharing Event

5.1 Boost4BSO Knowledge Sharing Event

The culmination of literature based research, status analysis and several feedback/discussion sessions with the Boost4BSO project partners is a concept for scaling up capacity building for BSOs, APs and other external participants. The ideal form factor for effective knowledge transfer was determined to be an event based collaboration that features use cases, open discussion and transfer of knowledge elements. The event also requires a technical platform support (D.T1.3.5) for knowledge management.

BSO Knowledge Boost Event <u>design specifics</u> are defined in a following fashion:

- It is an (Online – at the very least during the ongoing COVID-19 pandemic) event organised regularly by BSOs for BSOs.

- There is a "call" for line-up of most important I4.0 topics.

- Participants can register for topics of their interest.

- "Knowledge owners"/experts are identified and share their knowledge with other participants (peer-to-peer, workshop, online seminars, etc.).

- New 'knowledge owners' emerge after knowledge acquisition – multiplication of knowledge akin to a 'snowball effect'.

- New knowledge owners/"multiplicators" serve to spread/multiply the knowledge upon request later on during the time between the events (e.g. based on entry into a platform).

BSO Knowledge Boost Event <u>support infrastructure</u> is needed to sustain the operation of the event and it includes the following considerations:

- Templates for different knowledge object/topics – incl. "Resources"/References/Reference Projects ("what is this topic all about?")

- Templates for BSO-profiles ("who knows what?").

- Defined attribute set and controlled vocabulary for selected attributes.

- Search function for I4.0-knowledge/competences on ECC-platform.

- Organisational resources (e.g. org. moves from one to another; data management, inviting external expert, as with EU presidency).

- Clarification of motivators (e.g. participation is for free, if "ownership" of topic is taken over after the event; true learning experience; low-resource participation possible; hands-on-knowledge; possibility to empower employees, networking…..).

- Circular learning (e.g. topics are revisited next year (A trains B :: B uses knowledge and tells A what happened :: A learns from B).

- Discussion forum (e.g. later entries of knowledge owners on ECCP European Cluster Collaboration Platform. Experts could be moderators for "their" topic for one year).

Once support infrastructure is set up Wave 1 of capacity building can commence. The preparation for the Wave 1 of the BSO Knowledge Boost Event requires PPs to consider following steps:

1. PPs need to collect the desirable I4.0 topics for PP-BSOs (i.e. "knowledge objects"/project deliverables to be shared),
2. Profiles of BSOs/institution/experts need to be developed,
3. Knowledge object templates need to be developed, and
4. Further organizational considerations & limitations need to be addressed internally.

Figure 11 displays the starting point visualization for Wave 1. Prior to the exchange of knowledge PP BSOs (represented as circles of unique color) possess knowledge objects (e.g. project deliverables) they have acquired prior to the event (e.g. they participated in other Interreg CE projects).

Figure 11 – Snowball mechanism – Prior to the exchange of knowledge
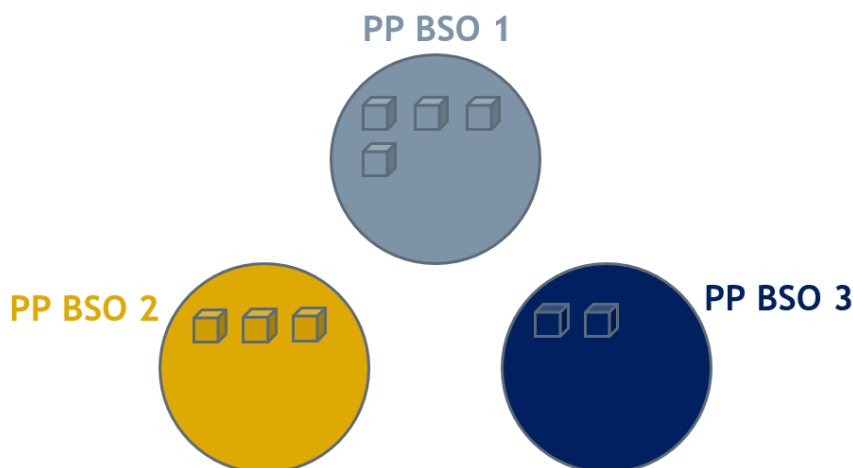

Singular "snowflakes" of knowledge distributed in Central Europe

PP BSOs possess a certain number of transferrable knowledge objects that are 'copied' by mutual exchange into repositories of other PP BSOs. Multiplication effect/Snowball mechanism is achieved by acquisition of new knowledge objects that provide partial expertise in the concerned topic. Figure 12 shows the visualization for knowledge object acquisition upon Wave 1 completion.

Figure 12 – Snowball mechanism – After the first exchange of knowledge – Wave 1
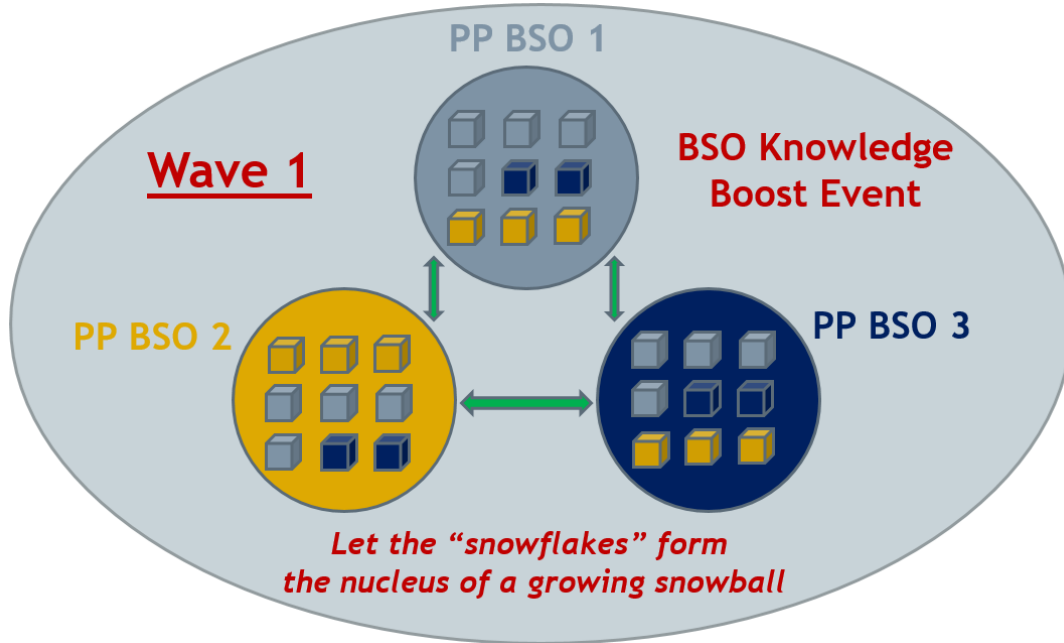
Downstreaming of capacity building continues in Wave 2 – once PP BSOs include their partner network (APs and external BSOs) in the following event. Figure 12 provides visualization for involvement of PPs' network in the BSO Knowledge Boost Event. New participants are represented by smaller circles, their pertaining knowledge objects are present but not visualized to avoid visual clutter.

Figure 13 – Snowball mechanism – Next exchange of knowledge – Wave 2
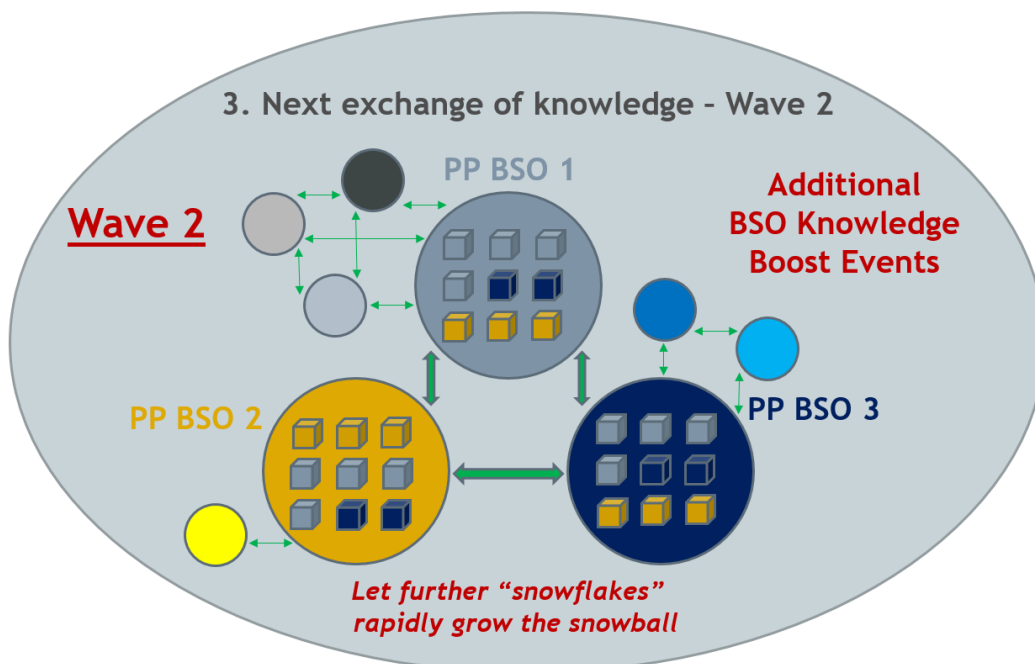
On average PP BSOs listed 7.85 partners in their network. Adjusted for unique partners the average drops to 7. The combined network size as provided by PPs includes 49 unique network partners + the original 7 PP BSOs. This relationship indicates theoretical 7x growth potential among given waves, however, these figures need to be adjusted for resource and transfer efficiency limitations.

It is reasonable to expect that the cooperation capacity utilization will not reach its full potential once the scope of WoD includes entities other than PPs themselves. Justification for the participation refusal can range from budgetary limitations, time-restrictions, and overall lack of interest in the topics of I4.0. Upon these considerations and extensive discussions among PPs with regard to realistic capacity for involvement of APs and external BSOs in the dissemination process it was established that knowledge can be realistically passed to 2 partners at a time. For the visualization in Figure 14 the exponential growth was further adjusted to 2 unique partners in the network - to better reflect the realistic capacity utilization.

Figure 14 – Snowball mechanism – Network growth potential for Wave 1, Wave 2 & Wave 3 of capacity downstreaming

Number of (potential) partners:
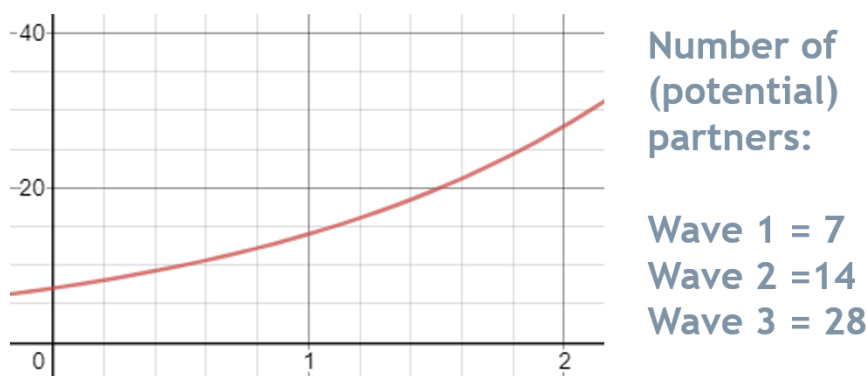
Wave 1 = 7
Wave 2 =14
Wave 3 = 28

Figure 14 showcases an ideal scenario, where every participant is able and willing to serve as a knowledge disseminator in subsequent WoD. Real-world implementation cannot attain this efficiency, it is expected that the capacity downstreaming growth will occur at a slower rate.

5.2 Further considerations for the Boost4BSO Knowledge Sharing Event

There are open aspects of BSO Knowledge Boost Event implementation which can be assessed and tested only at a later point of the implementation due to budget, time, and performance expectations and constraints. Examples of these further considerations include:

- Collection of data:
  - o Where to put it and how to relocate it? (Technical platform D.T1.3.5 implementation specifics.)
- Growing personal driven networks have their limits:
  - o How to deal with growth limitations?
- History of topics / "thread":
  - o How to organize/platform the development of knowledge within a topic? (Also dependent on D.T1.3.5 implementation.)
- Actuality of Information:

- - Shall knowledge objects age, what happens with out-of-date knowledge objects?
- Visualization of involvement in topics ("certificates") as rewards:
  - Should BSO participation by ranked and what is the criteria for performance evaluation (e.g. for spreading info, commenting/answering in forum, serving as multiplier etc.)
- Data protection:
  - How to deal with the publication of use-cases or reference companies in a network? How to deal with personal references? Who can retrieve which information?
- … other unforeseen considerations
  - How to steer the unaccounted and unbudgeted scenarios?

5.3 Key insights on scaling up capacity building for BSOs

As of September 2020, rigorous research was put into preparation and envisioning of downstreaming of capacity building. Practical implementation will introduce a detailed look into the performance of the snowball mechanism. Current key insights & take-away include:

- The concept of conference (BSO Knowledge Boost Event) for knowledge sharing matches the most prominently featured motivators (best practice exchange & networking) as recorded in the status analysis –encouraging BSO participation.
- The attractiveness of I4.0 topics for knowledge seekers is provided and their knowledge access exclusivity is accounted for by cross-domain and cross-regional design measures.
- The specifics for BSO Knowledge Boost Event organizational support infrastructure need to be further monitored and re-defined alongside its practical implementation. PPs will need to assess their commitment, resources and capabilities.

6. References

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