Developing, implementing, and disseminating an adaptive clinical reasoning curriculum for healthcare students and educators

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Social Network Analysis

The aim of a social network analysis (SNA) is to better understand a community and its relationships. A network can be displayed with vertices (members of the community) and edges (relation to others) and visualized with SNA tools, such as Gephi. Such tools allow the calculation of centrality or density of a network.
Based on the results of the SNA we will develop the social media strategy for the DID-ACT project.

1.Aims of the DID-ACT Social Network Analysis

In DID-ACT we will apply a SNA to find out ….
- on which channels we have what kind of network and where we can reach specific target groups / stakeholders
- who are the key-persons in our team for which social media channel considering not only the number of followers/connections, but also the diversity for example in terms of profession or country
- in which areas we should try to involve new followers
- how our social network changes/develops during the project.

2.Methods

In the following we describe how we implemented the SNA for the DID-ACT project including a description of the project phases and quality criteria.

2.1 Project phases

We will implement the SNA at least at three different stages during the project with a changing focus:

1) **Start of the project (Year 1)**
   Our main aim is to raise awareness for the project via social networks, find new associate partners or interested stakeholders who might be willing to take part in the needs analysis or who are willing to contribute at a later stage. We also want to provide information about the progress to those who have expressed interest. To gain more data for the needs analysis, we get in touch with our target groups via social media channels and ask for their opinions on selected topics of the needs analysis.
   Main target groups: Educators, faculty, student associations, healthcare education networks, healthcare professionals.

2) **During the development phase (Year 2)**
   Our main aim is to get feedback from the stakeholders and target groups for our envisioned curriculum, courses, and teaching material. We could use the

social media channels as an additional evaluation and feedback tool and also ask specific questions (e.g. publish a video and ask for feedback).
Main target groups: Educators, faculty, students, associate partners.

3) **During the implementation phase (Year 3)**
Our main aim towards the end of the project is the dissemination of the curriculum and the train-the-trainer course. We want to find schools and educators who are willing to adopt the curriculum or parts of it or want to be part of the pilot testing.
Main target groups: Educators, healthcare education institutions, healthcare companies, student associations, healthcare education networks.

2.2. Steps of the SNA

The SNA analysis in DID-ACT includes the following steps:

1) Creation of a list of potentially relevant social media channels and analysis of these channels:
    a) where are we already active and well connected
    b) where are our target groups mainly active
2) Choosing the most relevant channels for each project phase
3) Collect available information on the followers / contacts from the channels
4) Add the information into Gephi (https://gephi.org/) with
    a) Vertices = Accounts in the social media channel with attributes:
        ■ first name, name
        ■ country & city
        ■ type (business, academic, clinician, student, association/network
        ■ (profession)
        ■ (individual / network)
    b) Edges = connections between two vertices with attributes:
        ■ type of social media channel
5) Implement the SNA and summarize results and conclusions as a basis for the social media strategy

2.3 Quality criteria

For the implementation of the SNA we have defined the following quality criteria:
1. We include all partners involved at the current stage of the project and the channels they are most active in.
2. We consider and respect data privacy aspects and do not include or publish any personal not-publicly-available information of partners and followers.
3. The SNA provides practical conclusions for developing or refining the social media strategy.

3. Results of SNA at project start

The results of the first SNA for the project include the social media followers and contacts from the 11 participants of the kick-off meeting in January 2020. The analysis was performed in January/February 2020.

3.1 Potentially relevant social media channels

Table 1 shows potentially relevant social media channels (based on Wikipedia) for the DID-ACT project and indicates on which channels the project partners are already active.

Ranking	Channel	Partners active	Selected for analysis
	ResearchGate	yes	yes
11	Twitter	yes	yes
1	Facebook	mainly private	
14	LinkedIn	yes	yes
6	Instagram	mainly private	
2	YouTube	yes	
	Yammer (used by EU for projects)	yes	
3	WhatsApp	mainly private	
4	Facebook Messenger		
5	WeChat		
8	Qzone (China)		
9	TikTok (China)		
10	Sina Waibo (China)		
12	Reddit		
15	SnapChat		
16	Pinterest		
17	Viber		
18	Discord		
	Quora	yes	

	Tumblr		
	Telegram		
	MySpace		
	Flickr		
	Xing	yes	

Table 1: Social Media Channels and their use by the DID-ACT team members; ranking based on https://en.wikipedia.org/wiki/Social_media

For the initial SNA analysis we included ResearchGate, LinkedIn, and Twitter as on each channel most participants are active.

3.2. Results of the Gephi analysis

3.2.1 Followers (=Vertices)

Overall we identified **2560 contacts/followers** (=vertices) from all 11 team members who participated at the kick-off meeting in January 2020. These vertices were connected with **3356 edges** to the 11 team members.

Overall, the partners are connected to 94 different countries Naturally our network has more followers in countries represented in the team such as Germany, the US, Sweden, or Switzerland. Countries with more than 1% representation are shown in the following diagram.
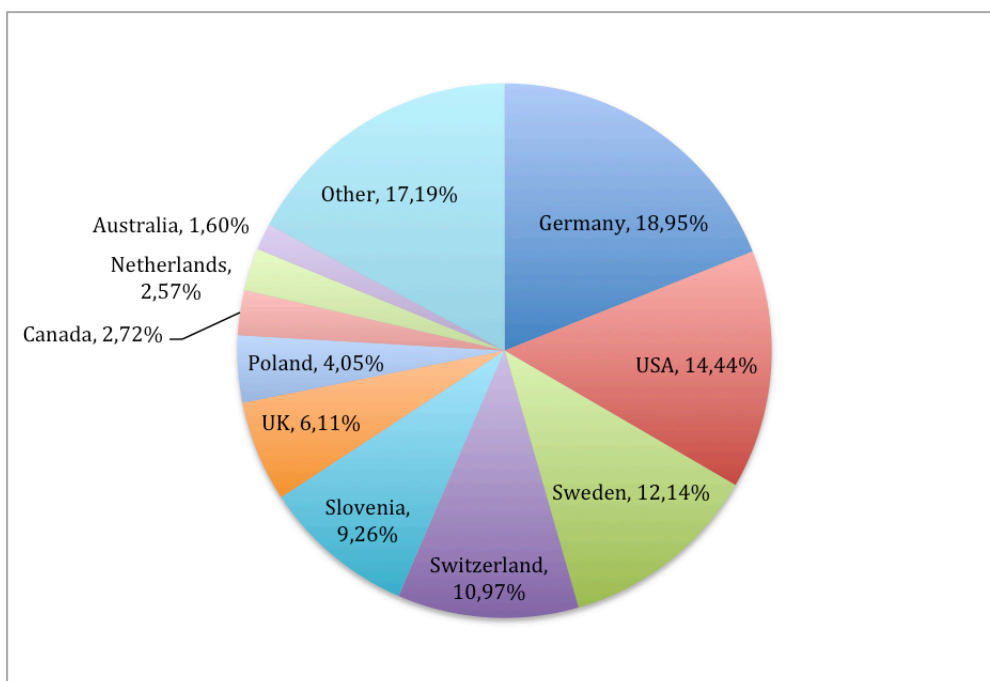

Diagram 1: Distribution of countries the followers are from

Almost 50% of the partners' contacts are from an academic/educator background, followed by about 21.5% with a health profession (physicians, nurses, physiotherapists, etc.) and about 18% with a business background. Students account for less than 2% of our followers/contacts (see diagram 2) and are mainly connected to one team member and from one country. Also, less prominent were publishers and governmental organizations. We are also connected to eight of our nine associate partners.
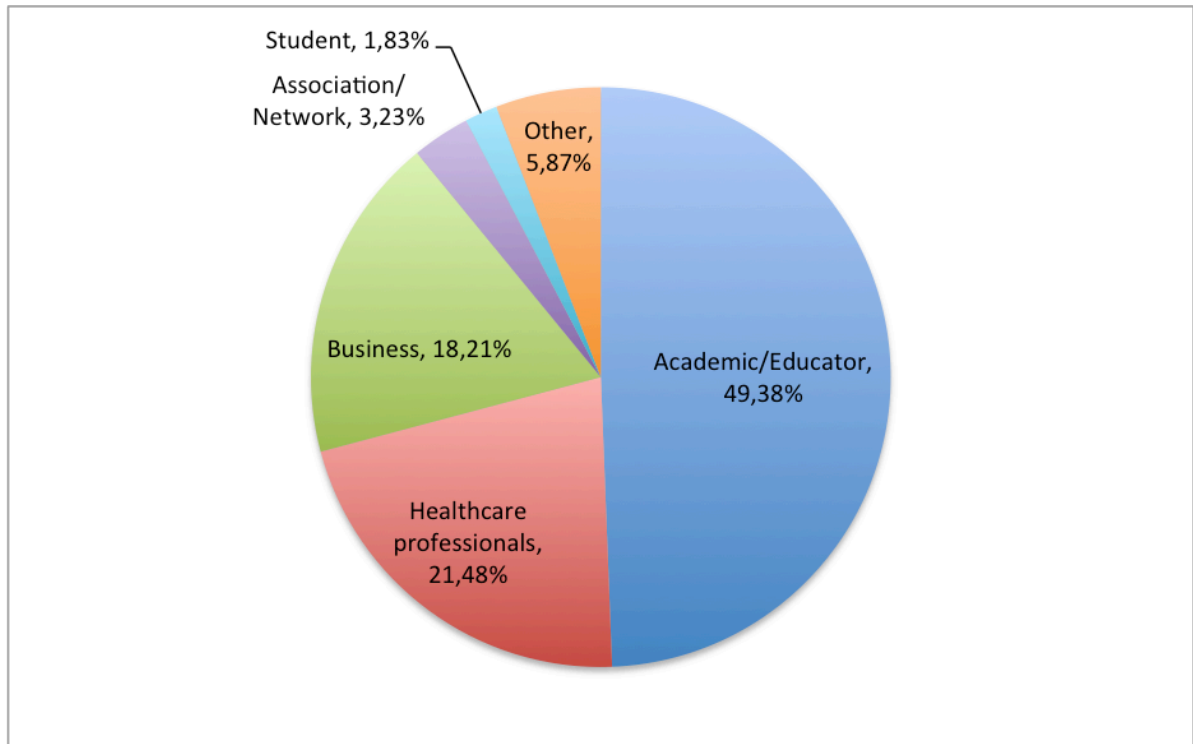

Diagram 2: Distribution of background of the followers/contacts

3.2.2 Connections (=Edges)

Our network heavily relies on LinkedIn accounting for almost 60% of the connections, followed by ResearchGate and Twitter (see diagram 3). In addition to these three channels we covered in the SNA, we also have project-relevant activities in YouTube and Yammer (used for networking of EC-funded projects).
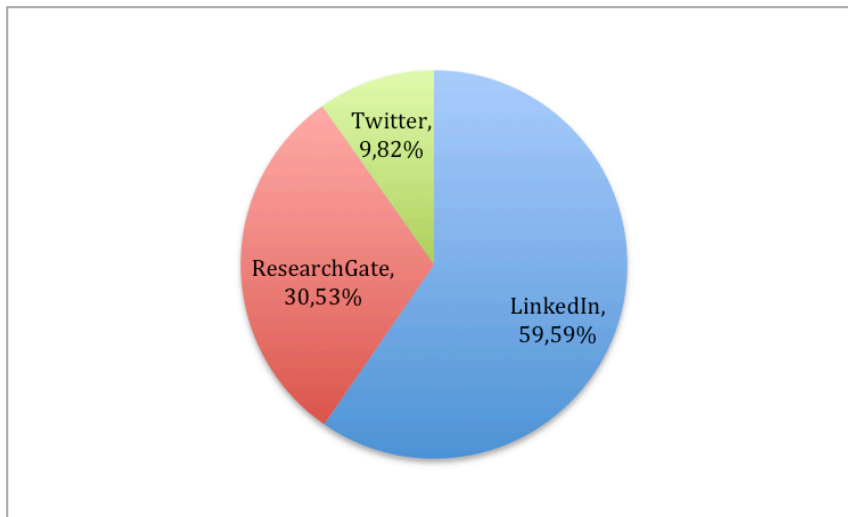
Diagram 3: Distribution of the three major social media channels partners interact with

Partner	LinkedIn	ResearchGate	Twitter	Total
P0	157	108	not active	265
P1	not active	241	not active	241
P2	94	27	not active	121
P3	269	95	14	378
P4	172	100	not active	272
P5	225	204	43	472
P6	103	71	not active	174
P7	not active	4	not active	4
P8	297	not active	216	513
P9	321	62	48	431
P10	16	93	not active	109

Table 2: Number of connections for each team member in the three networks.
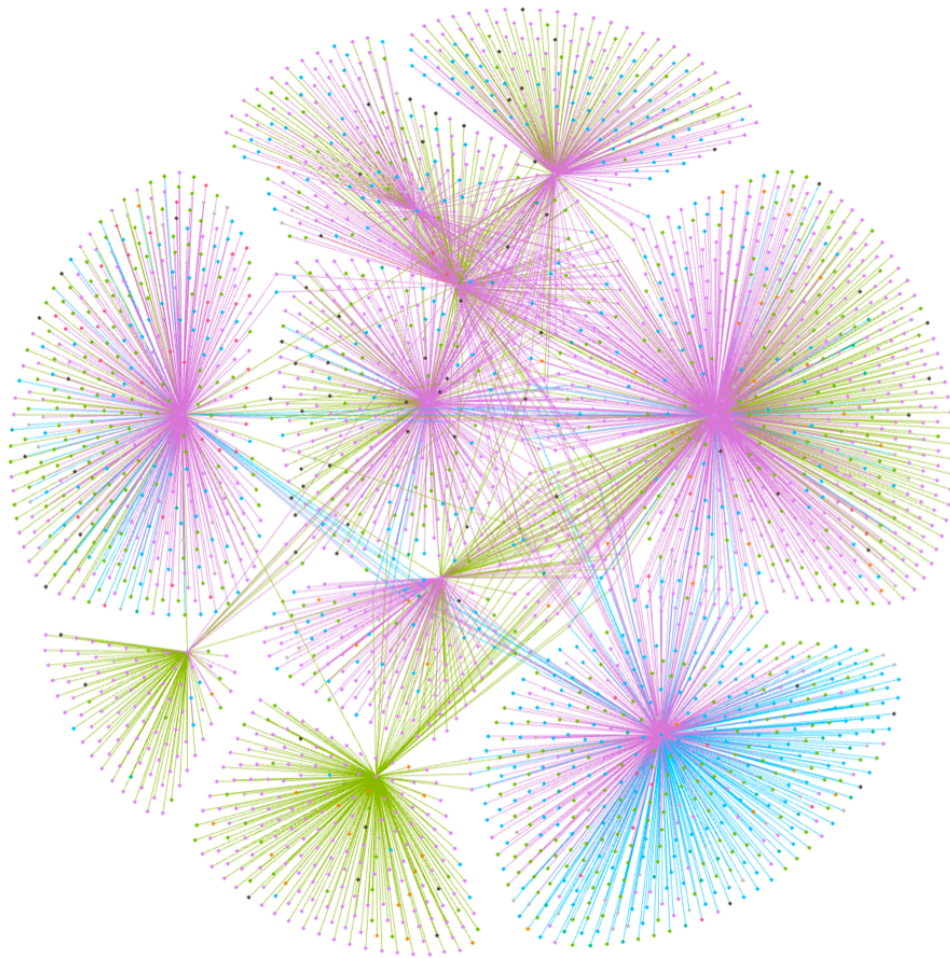
3.2.3 Network

Figure 1: Structure of the social network of the 11 team members (pink=LinkedIn, green= ResearchGate, blue=Twitter)

Figure 1 shows a screenshot of the project teams' network (applying the Fruchterman Reingold layout algorithm). The networks from most of the team members show some overlap, but despite different extents of networking activities, for 2167 vertices (= 84.7%) each team member is also the unique connection between the other members and his/her own network. This means that to maximize the outreach to our network we have to involve each team member for our strategy.

4. Conclusions

Overall, our current network is suitable to reach the main target groups of phase 1 (project start):
(1) With a majority of our followers having an academic/educator or clinical background, we have a suitable network for the project starting phase where these are our main target groups. However, we need to be aware that we are not yet well connected to healthcare students and student associations, which will become

especially important for the development phase of the project. For our social media strategy this could mean entering other channels where students are more active and / or involving more students in our project and include them into our dissemination strategy.

(2) With all team members having their own sub-networks that are not connected to any other team member our social media strategy should include all partners and the networks they are active in to maximize our dissemination.

(3) Some team members, who are less active in certain networks or not yet well connected, might want to expand their visibility during the project; this should be supported by our social media strategy.

(4) For the next SNA in the development phase we will include more information about the followers, such as healthcare professions (e.g. nursing, physician, physiotherapist), institutions, and also include new team members.

Social Media Strategy

1.Aims of the DID-ACT social media strategy

Social Media is the modern front door not only for businesses and enterprises trying to sell their products but also for research collaborations to create reach and awareness concerning the scientific topic that these collaborations are working on. Therefore, social media channels can be used to inform society and stakeholders about the progress of DID-ACT's work and inform people about clinical reasoning and the curriculum we develop. Social media can foster thought leadership, create word of mouth, attract future multipliers, healthcare schools and educators.

To achieve this, the primary goal of the social media strategy is to continuously increase awareness of the project during the three project phases and get in touch with followers and communicate with them.

Based on the results of the SNA we can define a dedicated social media strategy for the project deciding which channels we want to focus on at which stage of the project and through which accounts.

2. Strategy steps

A four-step process (Figure 2) shows a loop of continuous further development of the social media strategy. A plan for setting up a structured social media strategy will be implemented and used on a regular basis for monitoring purposes. Throughout all the above-described phases, we will implement the sections Audit, Develop, Engage and Measure.

Figure 2: Four-step process to audit and adjust a new social media strategy.

Audit

Throughout the project, the DID-ACT website (http://www.did-act.eu) will function as a home base which will deliver transparent information and the latest results of the project. Furthermore, through the website, we can create leads by leaving contact details and informing about our dissemination events.

Phase 1
The current Social media presence of partners has been assessed in the form of an SNA as a starting point to identify gaps and set profiles. We have identified the channels our team members are active in and their followers in each channel. LinkedIn, ResearchGate and Twitter are the channels with the most followers, but we also see YouTube and Yammer as the social media platforms used by the European projects as important dissemination channels. The SNA also showed that the DID-ACT team has only a limited number of student and student association followers.

Phase 2 and 3
At the beginning of phase 2 and phase 3, we will repeat the SNA. We will focus on analyzing how and where our network has grown and whether we are on the right track in reaching our aims.

Develop

During all project phases we will implement a content calendar in our project management tool to plan and list dates and times when posts are made to the various social media channels. This will ensure that posts are distributed evenly and published at the best possible times. We will develop a guideline for all partners to support those who are less familiar with professional posting to follow the most effective way of posting. This will include the most important recommendations, for example, to post pictures of DID-ACT's activities as much as possible to take advantage of an approximate increase of perception of about 35%[1]. In addition, the use of hash tags and the necessity of sharing posts of fellow partners and colleagues will be emphasized.

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[1] Internet source, @smfrogers, What fuels a Tweet's engagement?, https://blog.twitter.com/official/en_us/a/2014/what-fuels-a-tweets-engagement.html, retrieved 20th of March 2020

Phase 1

We will develop a dedicated strategy to involve more students and student associations in our network. Activities will include approaching students and student associations to analyze in which networks they are most active and a deeper analysis of further social media channels, such as Facebook and Instagram and students and student association we already reach. We will develop a short video introducing the main facts about DID-ACT. Information about our social media channels will be placed on the DID-ACT website.

Phase 2

We will implement the strategy to involve more students developed during phase 1 and closely monitor our progress. If required we will develop and implement changes to our strategy based on the results of the second SNA.

Phase 3

If required we will develop and implement changes to our strategy based on the results of the third SNA. We will develop a social media strategy that we will be able to sustain after the project has ended. This will include our main social media channels and the website (as part of D7.2) and will be part of the project's sustainability model (D7.5).

Engage

Phase 1

According to the content calendar, we will start the posting, which will mainly focus on the following topics and address the defined target groups of this phase (see 2.1):

- Information about milestones and results of our work packages, especially our needs analysis (work package 1)
- Posting questions and polls to our followers concerning our ongoing work packages
- Completed deliverable reports
- Planned dissemination events, such as presentations and workshops of conferences

The video providing information about the project will be published and disseminated via the coordinator's YouTube channel and will be shared in the other networks by all partners.

Phase 2

We will continue the posting of DID-ACT-related information with a focus on:

- Providing Information about milestones and results of the curriculum development progress
- Asking for feedback among our followers and especially students for material we develop or provide in our learning management system

- Informing about planned dissemination events such as workshops and presentations

Phase 3
During the final phase, the posts will focus on the following topics:

- Sharing and disseminating information about the student curriculum and the train-the-trainer course and experiences made
- Asking our followers for feedback related to the curriculum and the train-the-trainer course
- Information about planned dissemination events and workshops we provide for the curriculum implementation

Measure

After each phase of the project, the SNA cycle is repeated to see if the target groups of students and stakeholders has been reached, leads have been generated and the existing social media network has been expanded.
To continuously measure and evaluate the success of our strategy, we defined the following **performance indicators and quality criteria**, which have been developed as part of work package 6 (Quality management):

(1) During all three project phases we anticipate an increase of a minimum of 200 followers in the main social media channels. Since we already reach more than 2.000 educators, healthcare professionals and business stakeholders, we will mainly focus on increasing the number of student and student association followers.
(2) We aim to disseminate on average four project-related posts / month and share and retweet them to maximize the distribution in all partner networks and channels.
(3) We aim to have followers from >200 different healthcare institutions worldwide (> 150 from Europe) by the end of the project.
(4) 3-monthly monitoring of the strategy as part of work package 6 (Quality Management) and information to the partners.

3.Conclusions

We believe that following an approach of combining a social network analysis with a four-step social media strategy we can maximize the dissemination of our project updates and results. Moreover, the regular monitoring and analysis phases allow us to specifically adapt our strategy if needed to reach our main target groups during the three project phases.