

DISSEMINATION OF KNOWLEDGE

PROCESS SYSTEMATIZATION AND ITS IMPLEMENTATION

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Abstract

Dissemination proved to be a complex process that can take very diverse paths with questionable outcomes if not shaped correctly. And there are variety of views in research communities and the society of what the dissemination is. In such a situation it is natural to develop a more solid comprehension of the concept and, based on this, a model of the environment for the dissemination. This makes it possible to set goals of dissemination. By systematization the dissemination process is then shaped in such a way as to allow fulfilling the dissemination goals. To assure the process is carried out as defined, a system implementing the process is proposed. The model of the environment proved critical for the definition of the dissemination process and systematization proved to be a means for completing and structuring knowledge about the dissemination accordingly. Both are verified against a real dissemination process. Research communities can benefit from such a system in increased quality of dissemination achieved with less dissemination effort.

Keywords

dissemination, concept, process, model, systematization, implementation. Introduction

Izvleček

Diseminacija se izkaže za zahteven proces, ki vodi k vprašljivim rezultatom, če je neustrezno zastavljen in usmerjen. Raznolikost pogledov na diseminacijo v raziskovalnih okoljih in v družbi nasploh ne prispeva k poenostavitvi procesa. V takšni situaciji je naravno najprej oblikovati solidno razumevanje koncepta in nato oblikovati model okolja za diseminacijo. To pa omogoči postavitev ciljev diseminacije. S sistematizacijo vzpostavimo proces diseminacije tako, da omogoča izpolnitev teh ciljev. Za zagotovitev, da bo proces diseminacije tudi izpeljan tako, kot je zastavljen, predlagamo sistem, ki implementira ta proces. Model okolja se izkaže v tem kontekstu kot ključen za oblikovanje procesa diseminacije, sistematizacija pa se izkaže kot sredstvo za potrebno dopolnitev in strukturiranje znanja o diseminaciji. Tako model okolja kot sistematizacija sta bila uporabljena na resničnem procesu diseminacije. Raziskovalna okolja dobijo s tako zastavljeno diseminacijo večjo kakovost procesa ob manjšem naporu.

Ključne besede

diseminacija, koncept, proces, model, sistematizacija, implementacija

When new knowledge is generated by a project, it is essential that this knowledge is recorded and communicated to target audiences. Knowledge recording must preserve knowledge authenticity and arrange it in a form suitable for the target audiences. An appropriate communication channel must be provided for recorded knowledge to reach a target audience. These are also basic requirements for assuring quality in dissemination of knowledge. These basic requirements are complemented by recommendations and conclusions of different formal bodies and research studies (Council of the EU, 2007; EuropeAid, 2009; Fry et al., 2009; OECD, 2007; RIN,

2007; RIN, 2008; RIN, 2009; Scholarly Publishing Roundtable, 2010).

Dissemination is commonly coordinated based on a dissemination strategy (Kakaletris 2005, Viollier 2009). When knowledge to be disseminated is still in origination, the dissemination strategy should be developed based on incomplete information. To avoid this, the information gaps can be filled in based on educated guesses. Developed in this way the dissemination strategy may later need adaptation to the actual situation.

While carrying out the dissemination, it is important that the dissemination strategy reflects in dissemination actions. If not, dissemination proposals may appear claiming that they are important or even critical to the success of dissemination. If met, such proposals can cause spending significant dissemination resources for little or no effect. To avoid being caught in such a situation, we build a simple template called the dissemination scheme that mirrors and concretizes the dissemination strategy, which minimizes space for misinterpretation and dispute.

What is critical for the dissemination success is that right target audiences are determined. To meet this goal, we build a simple but feasible model of the environment, encompassing all the target audiences that have to be informed about the project and its results. Such a model enables qualified decisions and limits the number of intended dissemination actions.

In general, the dissemination could become a task of enormous complexity with questionable outcome if not shaped correctly. To minimize this risk, we decide to systematize the dissemination process, which provides us with a picture of what is to be disseminated, in what detail, when the dissemination actions should be carried out, by what means, by who and who are the target audiences.

Specifically, results to be generated during the project along with their mutual dependencies are identified. For each identified result, conditions for dissemination are set and arranged in records inserted into a template called dissemination scheme (Gerkeš 2009), which provides a basis for dissemination actions origination. When these conditions are met for any result, the best matches possible are searched for in the lists of target audiences. When the matches are found, communication records are created and inserted into a template called communication plan. To increase the quality of dissemination, we additionally define a set of dissemination policies (Kakaletris, 2005) that have to be followed by dissemination actions.

A communication record along with dissemination policies provides all the necessary data for preparing and carrying out a dissemination action. By means of the dissemination scheme and communication plan all the dissemination actions can be monitored and coordinated by the project management.

Systematization is of little use if not supported by a system that assures that the dissemination actions are carried out as determined by the dissemination scheme and communication plan. An implementation of the

systematized dissemination process is proposed that fulfils the systematization requirements.

Core of the work presented in this conceptual paper was carried out for dissemination process of the EGAIS (Ethical GovernAnce of emergIng technologieS) project of the Seventh Framework Programme funded by the European Commission. The presented dissemination process was implemented in the EGAIS project although it was not supported by the web based tools presented in this conceptual paper.

CONCEPTUALIZATION

Generally, the results to be delivered by a research project and their interdependencies are well elaborated in project proposals. With the project results we have the following situation: new knowledge, new technology, etc. and the environment where these results may fit in. Thus we can set the goal of dissemination: communication of the information and knowledge about the results to the environment.

Dissemination is about communicating information or knowledge to target audiences. We describe the situation before the dissemination as the existing situation and the situation to be accomplished by the dissemination as the desired situation. Thus, with the dissemination the transition from the existing to the desired situation occurs.

We define the existing situation by local environments that may have an interest in project results; and the desired situation by the same local environments supplied with information and knowledge about the project and its results to the extent they desire. The following scenario enables transformation of the existing situation into the desired one.

1. We have to identify the local environments (target audiences) along with their interest in information and knowledge.
2. We have to shape information and knowledge covering these needs.
3. We have to communicate the information and knowledge to target audiences.

Availability of a result implies a time frame suitable for its dissemination and the communication requirement implies a communication infrastructure capable of passing the intended information or knowledge.

This may not be a perfect scenario, however, it enables us to shape a dissemination action, which is communication of information or knowledge to a target audience. With the dissemination action, we can conceptualize

dissemination as a collection of dissemination actions. Based on interdependency of the results, dissemination actions are also interdependent. There is a precedence relation among them invoked by precedence of the results.

The scenario enables identification of basic relations composing a dissemination action.

1. Relation between project results and target audiences
2. Relation between project results, target audiences and types of information
3. Relation between project partners and project results
4. Relation between project results and results deadlines

With the basic relations we can set a template for a dissemination action: who, what, in what detail, to whom, by what means and when.

- Who: project partner (persons that disseminate the result).
- What: a result shaped as information or knowledge.
- In what detail: it is essential that the information or knowledge is shaped to the needs of the target audience (usually expressed by a document type – e. g. news release, presentation, paper).
- To whom: the target audience is a group of persons presumably having an interest in the result.
- By what means: communication infrastructure that has a capability to communicate the result to the target audience.
- When: a time frame suitable for the dissemination action.

In the above scheme only the project partner is a known entity. The result is actually an expected result. The target audiences are represented by a category (those who may have an interest in the result). The communication infrastructure can be determined based on knowledge about the communication capacities of the target audience.

To this point we have acquired knowledge about basic relations among dissemination entities and set a template for a dissemination action.

Dissemination strategy

Dissemination is commonly carried out based on a dissemination strategy, which is developed in an early project stage. While carrying out the dissemination, it is important that the dissemination strategy reflects in dissemination actions. Otherwise, dissemination proposals may appear claiming that they are important or even critical to the success of dissemination. If met, such

proposals can lead to spending significant dissemination resources for little or no effect. Reconciliation in such a situation can be strenuous and time consuming.

To diminish the space for dispute, each intended dissemination action is checked against the dissemination strategy, e. g.:

- Is the result to be disseminated (and not a general issue having little or nothing in common with the result)?
- Is the target category appropriate (are there reasons to believe that there is an interest in the result)?
- Is the document type appropriate (does it enable to pass the intended information or knowledge)?

If the checking is successful, the intended dissemination action is in agreement with the dissemination strategy. However, with such an approach there is no limit set to the number of dissemination actions, which can grow excessive in number.

To avoid being caught in such a situation, we build a simple and feasible model of the environment, encompassing all the target audiences.

Model of the environment

Actually, we build the dissemination on an intuitive model of the environment, which is based on our knowledge about the environment. With building the model we may get trapped into situations where our knowledge is insufficient and needs upgrading. With upgrading the knowledge we can gradually build a feasible model.

We associate each project result with characteristic attributes (e. g. ethics, information, communication, nanotechnology). Then we represent local environments as target categories (e. g. forums, conferences, journals, organizations, associations, societies, individuals) and associate target categories with the same characteristic attributes as the results (e. g. forum: ethics, journal: communication, conference: nanotechnology). In this way we build a set of target categories determining characteristics of local environments (e. g. ethics forum, communication journal, nanotechnology conference). By (partially) matching characteristic attributes associated with the results with characteristic attributes of the target categories, we identify categories of local environments that may have an interest in project results and also establish connections among them (which local environment may have an interest in which result) (Figure 1). (Such a model can also be made formal and matching can be carried out by a machine.)

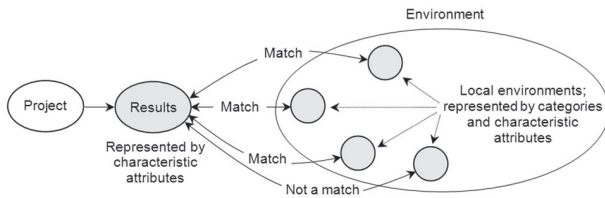


Figure 1: Discovering target categories

There is also a simpler way of building a set of target categories by immediate associations of characteristic attributes of project results with target categories. As this is not based on the model of the environment, we consider it less suitable.

Consequently we can represent successfully matched pairs by a table: project results, target categories (Figure 2). Such a table is, however, not well suited for further development. By decomposition, we transform the initial table into a tabular structure where each category (project results, target categories) is arranged as an enumerated list (presented by a table) and linked to a link table in such a way that the resulting tabular structure (Figure 2) is equivalent to the table before decomposition. (Such decomposition can also be carried out by a machine.)

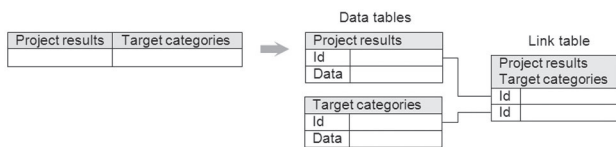


Figure 2: Relation between project results and target categories

Basic dissemination relation

We associate project results with project partners responsible for producing them (in general, not individuals), represent them by a tabular structure and integrate the structure with the structure: project results, target categories (Figure 3). Thus, we establish two groups of categories for communication that are connected via project results.

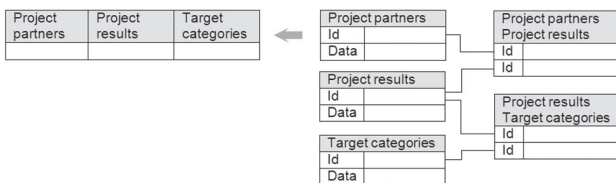


Figure 3: Basic dissemination relation

The table (Figure 3) provides us, in categorical terms, with a basic relation of what is to be disseminated, by whom and to whom. It, however, does not provide answers on when, in what detail and by what means the

results should be disseminated. This implies that the basic dissemination relation should be extended by deadlines and types of information determining the detail of content to be communicated to the target audiences.

Result deadlines

By associating the results and corresponding result deadlines we get a time scale determining the earliest possible starting dates for presenting the results to target categories (Figure 4). For inclusion into the dissemination scheme we represent the time scale by a table (Figure 5).

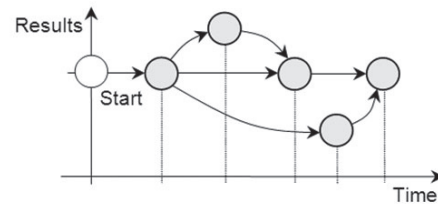


Figure 4: Relation between project results and results deadlines (schematic)

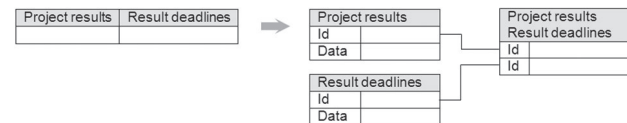


Figure 5: Relation between project results and results deadlines

Types of information

Not all target categories need information of the same detail. To fulfil this requirement target categories should be characterized also by their information needs to allow communicating the right information (Lund, 2010; Pilerot, 2011).

We determine information needs by different views on the project. Each view implies different information needs. The following types of information may be convenient for representing a technological project and its results to a technological target category:

1. Information about the project and expected results
2. Information about the result
3. Information that enables accessing feasibility of the result for a specific purpose
4. Knowledge that enables implementations based on the result

In this way a target audience can be approached in succession with diminished possibility of information overload. The succession can be stopped at any time if the target category is not interested any more in further information or knowledge.

Presenting a technological project to a non-technological target category may be convenient by the following types of information:

1. Information about the project, expected results and a short explanation of how the expected results would influence a specific environment
2. Knowledge that enables bridging the gap between background knowledge and knowledge needed for a full comprehension (e. g. a glossary and a tutorial)
3. Information about the result that makes it possible to assess the influence of the result to a specific environment

Information types can be conveniently replaced by document types (e. g. a leaflet, poster, presentation, paper, report, tutorial, data set, animation – presenting a technology, video clip); each document type implies the type of information it presents.

Associations of project results and target categories (Figure 2) enable the determination of appropriate contents to be communicated to a target category. By matching contents with document types we determine, which document types best serve intended communications (Figure 6). When matching, imposed restrictions should be taken into account (e. g. a conference document types – poster, paper).

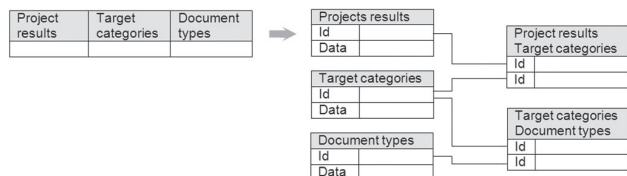


Figure 6: Relation between project results, target categories and document types

It is acceptable to associate more than one document type to a target category (a target category can be associated with more target audiences having different information needs).

Document types enable associations of means for communicating associated documents. However, there are limits to these associations: availability of means for producing and rendering documents content. In more cases document types and means for communicating documents are determined by target category (e. g. a conference).

DISSEMINATION SCHEME

By joining all the decomposed tables into a tabular structure we get a scheme containing everything developed so far (Figure 7).

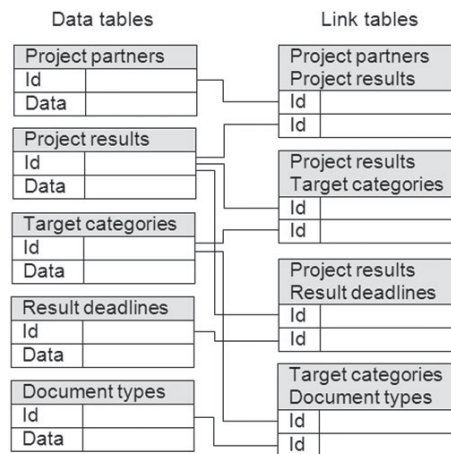


Figure 7: Tabular structure of a dissemination scheme

From this scheme different implementations can evolve (e. g. a single table, database, web service).

By applying commutativity and transitivity relations we create a scheme for dissemination by composing the enumerated lists (represented by tables) (Figure 7) into a single table (Table 1).

Dissemination scheme				
Result deadlines	Project results	Project partners	Target categories	Document types

Table 1: Dissemination scheme

A dissemination scheme gives us a pretty good insight into what is to be disseminated, when, by whom, to whom and in what detail. However, such a dissemination scheme is still not complete and needs further detailing (e. g. a target category may represent more than one target audience) and possibly extensions (undecided at this point of development).

We also want to present to target audiences the project with its goals, general topics (e. g. theoretical foundations, methodologies) related to the project and possible exploitation of the results. And at any time we want to know the actual status (e.g. created, in progress, completed, stopped) of any dissemination action. This makes the dissemination scheme more complete. To meet these requirements we modify and extend the dissemination scheme (Table 2).

Dissemination scheme					
Deadlines	Titles	Project partners	Target categories	Document types	Status
General issues related to the project					
Project presentations					
Project results					
Possible exploitation of the results					

Table 2: Complete dissemination scheme

Such a dissemination scheme enables balanced dissemination of all issues related to the project.

Implementation of a dissemination scheme

There are more ways to implement a dissemination scheme (e. g. as a table created by a text editor, spreadsheet, database, web based service). We will demonstrate implementation of a dissemination scheme as a web based service.

Populating and updating a dissemination scheme can be time consuming. The amount of work can be reduced by automatically populating result deadlines, project partners and project results of the dissemination scheme (derived from project data). This leads us to a partly composed dissemination scheme that is suitable for web based implementation (Figure 8) and is further populated with data by using web based forms.

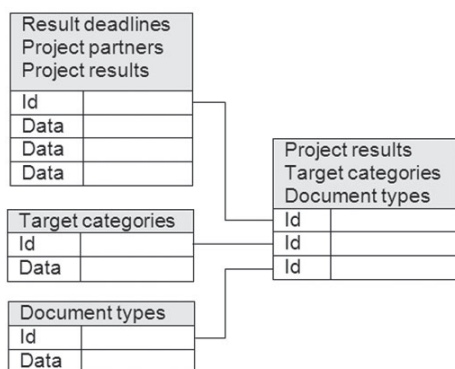


Figure 8: Tabular structure adapted for web based implementation

Figure 9 shows an arrangement for web based implementation of a dissemination scheme. Pages shown are generated dynamically by scripts (e. g. PHP script) (PHP Group, 2011) running on the web server. The first page is generated by a project partner responsible for dissemination and remains unchanged throughout the dissemination. All other pages are generated on user's

request only. Each time the dissemination scheme is updated, a copy is saved and is accessible as a web page (from Home page).

Dissemination record creation

Scenario – New dissemination record creation (Figure 9)

The user

1. [Page 1] selects a record (deadline, title, project partner) [submits form]
2. [Page 2] selects a target category and document type [submits form]
3. [Page 3] inspects the created dissemination record

Scenario – Created dissemination record modification (Figure 9)

The user

1. [Page 2] selects a target category or document type [submits form]
2. [Page 3] inspects the modified dissemination record

After carrying out any of the above scenarios the user can decide to:

- create yet another new dissemination record
- modify already created/modified dissemination record
- return to Home page
- do nothing

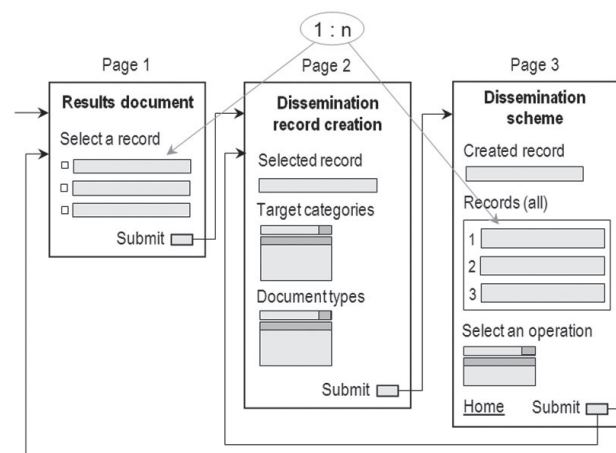


Figure 9: Dissemination record creation

Each dissemination record is updated several times (e. g. status information) during the dissemination. A dissemination record can also be deleted. The following scenario depicts a dissemination record modification or deletion.

Dissemination record modification

Scenario – Dissemination record modification

The user

1. selects a dissemination record [submits form]
2. modifies the dissemination record [submits form]
3. inspects the modified dissemination record

Scenario – Dissemination record deletion

(impossible if a communication plan record is already created)

The user

1. selects a dissemination record [submits form]
2. confirms dissemination record deletion [submits form]
3. – (notification of dissemination record deletion)

COMPLETING DISSEMINATION DATA

Although a dissemination scheme presents all the dissemination actions, the dissemination records do not contain all the necessary data for carrying them out. According to the pattern "who, what, in what detail, to whom, by what means and when", we still have to specify the target audience and the deadline of the dissemination action.

We can associate one or more target audiences (e.g. ACMSE, ETHICOMP) with each target category (e.g. a conference). Some target audiences (e.g. conference participants, journal subscribers) are specified implicitly by attributes (e.g. conference title, web address, conference topic, place, date, contact).

Other target audiences are specified explicitly (e.g. newsletter recipients, ad hoc work group members). To unify processing we specify each target category by a collection of attributes, and in case of an explicitly specified target audience we link the specification to the list, specifying members of the target audience.

Figure 10 shows an arrangement for creating target audiences. Pages of the arrangement are generated dynamically by scripts running on the web server. Each time a target audience list is updated, a copy is saved and is accessible as a web page.

Target audience record creation

Scenario – New target audience record creation (Figure 10)

The user

1. [Page 1] selects a target category [submits form]
2. [Page 2] fills in the values of target category attributes (e.g. Event attributes) [submits form]
3. [Page 3] inspects the created target audience record

Scenario – Created target audience record modification (Figure 10)

The user

1. [Page 2] modifies the values of target category attributes [submits form]
2. [Page 3] inspects the modified target audience record

A target audience record can be updated (e.g. event deadlines change) or deleted. (The scenario for target audience record modification or deletion is quite similar to the scenario for dissemination record modification or deletion.)

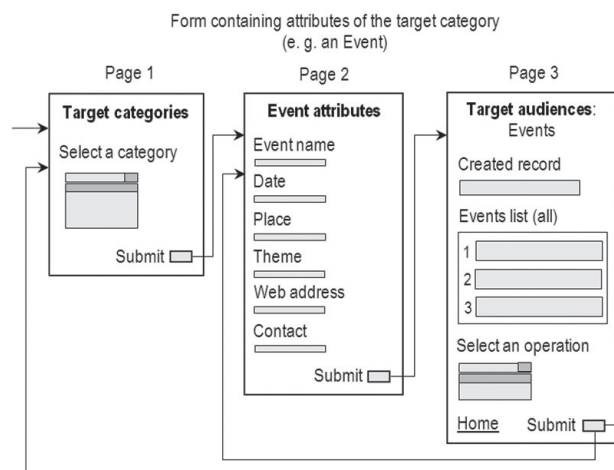


Figure 10: Target audience (events) list creation

An explicitly specified target audience is an enumerated list created by matching attributes determining its members with the attributes in the records containing members data (e.g. by matching project leaders attributes in the class of nanotechnology projects records, a target audience of project leaders in nanotechnology can be created).

Creating an explicitly specified target audience is most of the time a laborious work. For a target audience for which a collection of records exists (e.g. structured records

about projects) the target audience can be created by a machine.

A target audience can also be created as a union of two or more target audiences created based on two or more categories (e. g. newsletter recipients).

Figure 11 shows an arrangement for creating an explicitly specified target audience in the form of an enumerated list. Pages of the scheme are generated dynamically by scripts running on the web server. Each time the target audience list is updated, a copy is saved and is accessible as a web page.

Member record creation

Scenario – New member record creation

(Figure 11)

The user

1. [Page 1] selects a target audience [submits form]
2. [Page 2] fills in the values of member attributes [submits form]
3. [Page 3] inspects the created record

Scenario – Created member record modification (Figure 11)

The user

1. [Page 2] modifies the values of member attributes [submits form]
2. [Page 3] inspects the modified record

A member record can be updated (e. g. member position changes) or deleted. (The scenario for member record modification or deletion is similar to the scenario for dissemination record modification or deletion.)

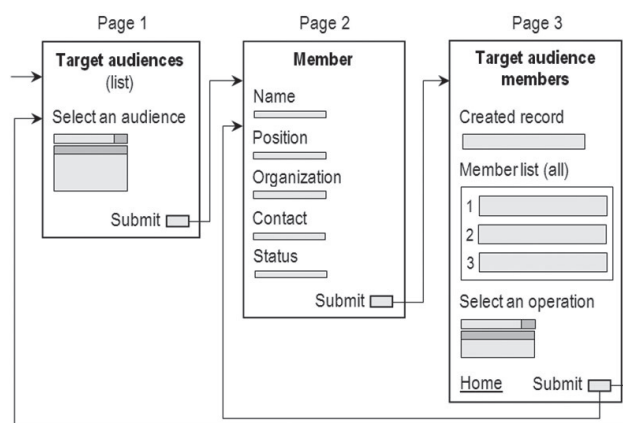


Figure 11: Member record creation

Prospective members can also add themselves to the list (e. g. using a form on the project website).

Deadlines of dissemination actions

Results deadlines along with important dates (e. g. for a conference, workshop, journal) enable us to set up deadlines of dissemination actions.

Content can be passed in more consecutive steps (e. g. an abstract, draft paper, final paper). This introduces more documents and more deadlines to a dissemination action. There are more ways to record these steps; we decide to collect them in the deadline field and represent them by pairs: content type, date (e.g. abstract: 8 Oct 2010, draft paper: 15 Jan 2011, final paper: 30 May 2011).

COMMUNICATION PLAN

A dissemination scheme can be considered an abstract presentation of the desired situation as it is created to ensure the best possible coverage of local environments with information and knowledge about project results. This goal can be reached by dissemination actions. When an expected result becomes a result, a dissemination action can be initiated (target categories can be replaced by target audiences and dissemination action deadlines can be set).

By having all data necessary for setting up a dissemination action we can represent it by a communication record and arrange all the records in a plan of communications represented by a list of communication records ordered by dissemination actions deadlines. A communication plan (Table 3) is created gradually as the results become available and is by its arrangement a time determined scheme of dissemination.

Communication records are linked (automatically) with corresponding records of the dissemination scheme. A communication record is linked to the (applicable) document template, to the document to be disseminated and the target audience (e. g. an event). The current status of each dissemination action is described by status information. The status of the corresponding dissemination record is automatically updated whenever the status of the communication record changes. This enables us at any moment to realize how much of the intended dissemination has already been covered by dissemination actions.

Most of the communication record data is derived from the corresponding dissemination record (title, document type, responsibility) and is completed with a target audience and deadline based on the target category and result deadlines data from the dissemination record.

Communication plan						
Reference	Title	Document type	Deadline	Responsibility	Target audience	Status

Table 3: Communication plan

Communication plan can be considered a detailed representation of the desired situation. It can easily be rearranged in the same form as the dissemination scheme.

Communication plan implementation

Figure 12 shows an arrangement for a web based implementation of the communication plan. Pages shown are generated dynamically by scripts running on the web server. Each time the communication plan is updated, a copy is saved and is accessible as a web page.

Communication record creation

Scenario – New communication record creation (Figure 12)

The user

1. [Page 1] selects a dissemination record [submits form]
2. [Page 2] selects a target audience and sets deadlines [submits form]
3. [Page 3] inspects the created communication record

Scenario – Created communication record modification (Figure 12)

The user

1. [Page 2] selects a target audience or changes deadlines [submits form]
2. [Page 3] inspects the modified communication record

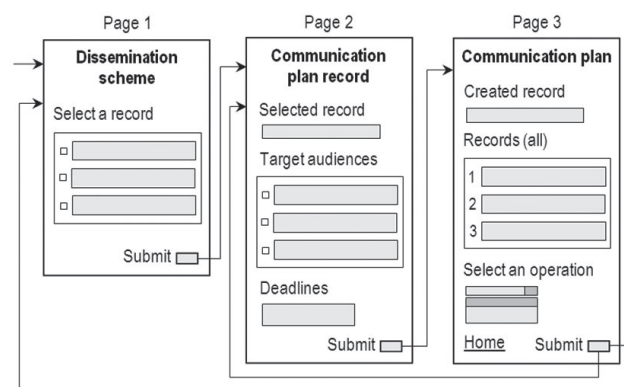


Figure 12: Communication record creation

A communication plan is continually updated. The communication records cannot be deleted (dissemination action can only be stopped or redirected to another target audience). The following scenario depicts a communication record modification.

Communication record modification

Scenario – Communication record modification

The user

1. selects a communication record [submits form]
2. modifies the communication record [submits form]
3. inspects the modified communication record

Scenario – Communication record modification

(modified record contains errors)

The user

1. modifies the communication record [submits form]
2. inspects the modified communication record

All the records creation pages are accessible from Home page and there is a link to Home page from each final page of each scheme. In this way all the schemes are arranged as a part of the website.

MAKING DISSEMINATION WORK

The dissemination process developed so far is of little use if not carried out correctly (e. g. the dissemination records are not created and updated on time). Dissemination actions are governed by dissemination policies (e. g. a project partner planning a dissemination action invites other partners to participate) (Kakalettris, 2005) set up in support of quality dissemination. Dissemination policies simplify the creation of dissemination activities work-flows, which are in our case maintained by means of a messaging system.

The messaging system is triggered by critical events (e. g. deadline violation) in the work-flows. In case of work-flows violations, project management and project partners get (selectively) notified about the violations, which enables corrective actions to take place.

Events that trigger the messaging system

Examples of events relating to the dissemination scheme (the dissemination scheme is made machine readable):

1. A partner who had not created a record (e. g. current date is significantly higher than the deadline of a result) got notified to create the record.
2. Whenever a record in the dissemination scheme is created, project partners get notified.

An example of an event relating to the target audiences:

1. A partner having information about a target audience of interest to the dissemination (e. g. an event) creates a record (e. g. in Target audiences – Events). Creating the record triggers notification of partners about the event.

Examples of events relating to the communication plan (the communication plan is made machine readable):

1. A partner who had not created or updated a record (e. g. dissemination record created - communication record not created) got notified to create or update the record.
2. When a record in the communication plan is created, partners get invited to participate in preparing the presentation of the result. Requirements that have to be met by the presentation (e. g. the presentation should be prepared in compliance with specific/common rules, the presentation should reference the project) are a part of the invitation.
3. When the presentation of the result is prepared, the status in the communication record is changed, and the rest of the partners get invited to review and comment on the presentation.
4. After giving/completing the presentation, the status in the communication record is changed, and the partners get notified about any significant feedback.

Submission of any data always triggers validation of data, which prevents submission of incomplete and unchecked data.

About the events partners do not need to be informed about immediately the messaging system creates journals. A partner gets access to these journals when entering the system. The messaging system creates and maintains a journal of newly created target audiences, a journal of deleted dissemination records, stopped dissemination actions, etc.

To assure only relevant messaging each project partner unchecks a preferences form listing all the message types. (Some of the messages cannot be unchecked – e. g. partner deadline violation messages.)

A messaging system, which can be implemented by scripting, checks the dissemination documents regularly.

When an event occurs (e. g. a deadline violation), it creates and sends a message. The messaging system is activated also after each event that requires an action (e. g. a partner has created a communication record).

The automated messaging diminishes the amount of work. It should, however, be designed with a sense of reality (intuitiveness, politeness, supportiveness – e. g. a partner is unable to create a record due to incomplete information about an event; the system should be supportive in such a situation and should enable the dissemination team to get involved and help resolve the situation) (Mulligan and Mabe, 2011).

Dissemination is not a perfect process

Not all interests in the project can be served adequately. Such an attempt would result in excessive dissemination efforts. However, a source (e. g. a website) containing all available information about the project and its results can be provided. And based on target audiences feedback, additional dissemination can be initiated if necessary. In this way the target audiences can be served more adequately.

The information provided, however, needs to be arranged in such a way to serve a variety of needs. This includes bridging the gap between the background knowledge of target audiences and required knowledge for target audiences to fully benefit from project results (e.g. a glossary, tutorial, answers to frequently asked questions) and also additional topics not covered by the information source content but related to the project results (e. g. by a discussion forum, internet events).

This way we can prevent excessive growth in dissemination actions count and assure access to project results for all interesting parties.

Dissemination management

Management of dissemination activities is seamlessly integrated into them. There is a dissemination scheme, a communication plan, a set of dissemination policies and a set of tools intended to be in support of adequate presentation of the project and its results to target audiences.

Each project partner is quite aware of what results it should deliver and when. And it is also aware of target categories that should be informed about the results. This allows us to build a scheme of dissemination actions. The dissemination scheme should be under continual consideration by the project partners in a discussion forum and is filtered through discussions, which enables

the dissemination scheme to be (continually) adapted to current situations. The dissemination scheme is considered a template of what is to be presented, by whom and when. Dissemination actions specified in this way do not need special management because each project partner knows exactly what to do and when.

However, the dissemination scheme and communication plan enable monitoring the dissemination actions and perceiving deviations. The project management is to propose necessary corrections in case of deviations.

CONCLUSIONS

There is a variety of views of what dissemination is (ranging from presenting research results in professional journals and at international conferences to complete marketing of results). Both views are extreme and miss the intuitive goal of dissemination. Presentations of research results in professional journals and at international conferences reach only a limited number of those, potentially influenced by exploitation of the results (and due to ever increasing specialisation of knowledge can also miss other professions that may have an interest in the results). On the other hand, many research results (e. g. technologies) are not suitable for immediate exploitation. A lot needs to be done before (e. g. evaluation, further development, testing). And even then the exploitation of the results should remain under control. Skipping these steps can have an immense negative and long lasting impact.

No matter how the research is funded, we can speculate that the research is carried out for the benefit of the society. Estimating the potential impact of the project on the society can go far beyond the capacities of the project team. History of science and technology reveals that the evolution of our societies could have taken very different paths from the existing ones if scientific and technological discoveries would have been treated differently. This is why it is important that the information about scientific and technological discoveries should be made widely available and should be suitably arranged for target audiences.

It is unreasonable to expect that a project team could do all the dissemination to potentially interested parties. However, there are two things that cannot be avoided: presenting the results to the professional communities most qualified to evaluate them, and providing detailed and understandable information about the results to the society. In this way, two important feedbacks can be created: one from the professional communities and the other from the society, first having a potential to evaluate the results, the second having the potential to

make a holistic estimation of the potential impact on the society. Information about the results can activate other professional communities that carry out complementary research to provide valuable feedback.

Not all projects can have the same scope of influence (e. g. local, global), but, the above presented pattern scales accordingly. This pattern is not an all encompassing pattern (e. g. a group of stakeholders may require more influential position in evaluating project results), but, it is a foundation for a more productive exploitation of research results.

Systematization of the dissemination assures that target audiences are addressed directly and provides access of the society to all research results by means of an information source (e. g. a website). Visibility of project information sources could be significantly enhanced by funding agencies providing independent long term indices of funded projects with links to project information sources (including links to archived projects documents).

We have learned that the refinement of a concept broadens comprehension. Naïve comprehension of dissemination at the beginning developed, with refinement, into more mature comprehension, which enables to better serve the needs of target audiences and the society. This shows that sticking to an established comprehension of a concept may prevent us from quality results.

Modelling and systematization of the dissemination process were essentially driven by our desire and need to communicate information and knowledge about research results to target audiences. This situation is not the same as in quality assurance where requirements to be met are known in advance. However, based on the results obtained we can be confident that the needs of target audiences and the society's expectations can be met better.

The presented systematization and proposed implementation of the dissemination is not the design. It is merely a systematized presentation of initial and evolving knowledge about the topic under observation acquired during the process of systematization. Thus, the systematization is basically a means for completing and structuring knowledge about the topic under observation. It may turn out that additional systematization cycle (or cycles) is necessary before knowledge about the topic under observation can be considered sufficiently complete.

What is missing, is the estimation that the proposed system can be considered fit for purpose. There are more ways to come to such an estimation, perhaps the safest one is to build a simple system based on the

schemes developed. In a short time such a system can be developed to a stage where all its critical parameters can be estimated. Based on this the production system can be specified, designed and implemented. This is a cost effective way considering that such a system can later, in a deployment stage, be of service to many research projects, be it a stand alone web solution for any project or a web service to more projects.

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