Social Semantic Web Fosters Idea Brainstorming

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Abstract. Generating and identifying promising ideas represent important challenges for any Enterprise that is focused on knowledge-intensive activities. The generation of new ideas, especially high-quality creative ideas, is vital to business success. Brainstorming is a didactic method that can be exploited to sustain the development of high order skills considered fundamental to foster innovation. On the other side, brainstorming sessions produce new ideas that have to be evaluated and possibly selected. In this paper the Social Semantic Web is exploited in order to define an approach for brainstorming that overcomes the limitations of the existing systems supporting groups in generating ideas. The Semantic Web-based structures organize, correlate and simplify the search for user-generated contents (e.g. ideas). Meanwhile, user-generated contents are analysed in order to elicit non-asserted correlations between them that are used to enrich the aforementioned structures.

Keywords: Social Semantic Web, Brainstorming, SIOC, Knowledge Forum, Knowledge Extraction, Idea Generation, Idea Selection, Innovation

1 Introduction and Motivations

Generating and identifying promising ideas represent recurrent and critical challenges for any Enterprise that is focused on knowledge-intensive activities and innovation. The generation of new ideas, especially high-quality creative ideas, is vital to business success. In order to foster the idea-related processes new strategies and environments to develop High Order Thinking skills (HOT skills) have to be re-thought. Critical thinking, reflection, problem-solving, etc. are fundamental skills for maintaining and improving innovation processes [9]. The research activities on Technology Enhanced Education (TEE), and in particular on Workplace Learning, point on e-Brainstorming as a didactic method guiding a learners' group to learn by progressive argumentation and idea development.

At the same time, e-Brainstorming allows developing and improving the thinking skills by exporting the identified promising ideas in order to further investigate them together with other groups to achieve a solid result in terms of feasibility and originality of the selected ideas. Moreover, e-Brainstorming allows to overcome the production blocking and conformity effect in teamwork [5], by doing so it improves comparison, negotiation and decision-making processes. Some consideration have to be expressed:

- The numerous existing Group Support Systems (GSSs) developed in order to assist people during the idea generation process are based on a vision known as Osborn's conjecture: *if people generate more ideas, then they will produce more good ideas*. Hence, these systems do not take care of the process transforming the quantity into quality with respect to the generation of ideas [14].
- The need for overcoming the limited vision of GSSs has conducted to the *Bounded Ideation Theory* [3] stating that an effective brainstorming model must sustain an iterative process that involves two mains strategies: idea exchange (sharing ideas within a brainstorming group) and generation (accumulating numerous ideas) at the social level and idea expansion (building new ideas starting from existing ones) and selection (identifying of most promising ideas) at the cognitive distributed level [18].
- Despite the brainstorming literature has agreed to support the discovery of connections among different ideas can be significant to effectively support the steps from idea generation (divergent thinking) to idea selection (convergent thinking), there exist few systems that support the automatic discovery of the aforementioned connections [11].

The present work proposes a *Brainstorming Model*, based on the Social Semantic Web approach, that takes care of the Bounded Ideation Theory to overcome the Osborn's conjecture. The used Semantic Web-based structures allow tool interoperability and simplify query and inference operations. On the other hand, the *Brainstorming Model* is based on the most common asynchronous communication/collaboration tool of the Social Web: the Discussion Forum. A language-independent keyphrase extraction algoritm is also applied to support correlation discovery between ideas coming from different groups. The work is organized as follows. In the Section 2 the *Brainstorming Model* is defined on the basis of the *Knowledge Forum Model* by extending Semantic Web-based ontologies. Furthermore, in Section 3.1 an approach, based on a keyphrase extraction algorithm, to automatically discover correlations between ideas coming from more than one brainstorming sessions is illustrated. In Section 4 some conclusion is provided.

2 Extending SIOC for Brainstorming

In this section a *Brainstorming Model* is defined. The approach proposed in the present paper is to exploit the *Knowledge Forum* in order to provide a suitable brainstorming environment. Morever, the defined *Brainstorming Model*

will be described by extending SIOC (Semantically-Interlinked Online Communities) [2]. SIOC is an attempt to link online community sites, to use Semantic Web technologies to describe the information that communities have about their structure and contents, and to find related information and new connections between content items and other community objects. SIOC is based around the use of machine-readable information provided by these sites. The adoption of SIOC provides the following benefits:

- fostering interoperability among different tools (also of different typologies like wikis, blogs, instant messaging, etc.);
- simplifying the link with external data sets, vocabularies, thesauri, folksonomies and with other Semantic Web-based schemes;
- improving and making cheaper the reuse of user-generated content;
- providing a semantic layer to be queried and inferred by using standard languages (SPARQL[4], OWL/OWL2[10]) and reasoners.

2.1 Brainstorming Model Definition

The brainstorming is a problem-solving technique defined by Osborn [12] based on a group discussion led by a moderator. The purpose of a brainstorming session is to make possible the growth of the biggest possible number of ideas about a specific issue. The brainstorming technique is also considered a relevant didactic method. In fact, it can be also classified as an argumentative practice [1]. A strong point of brainstorming is the ability to use the suggestions provided by all participants in the group, so that an idea proposed by a group member can suggest to another a new idea, perhaps more appropriate to reach the best solution. The focus, in the first phase is to produce the greatest number of ideas, which is initially more important than their quality, especially because the greater the number of ideas, the greater the likelyhood of finding some useful. In a second step, which is the more challenging phase of a brainstorming session, ideas should be evaluated, in relation to their effectiveness, selected and developed further. In the proposed approach, a brainstorming session prefigures the presence of a *moderator* while the other *participants* have no specific roles. The topic of discussion has to be not completely defined in order to unleash the power of idea generation, the ideas have to be freely expressed in the initial phase given that quantity is more important than quality at this stage. So, according to our model the brainstorming session consists of three different phases:

- *Activation.* In this phase the issue, on which the discussion has to take place, is presented and the participants have the possibility to socialize.
- *Production.* In this phase the moderator asks participants to speak freely on the subject, urges them to be active, asks questions, rewords questions. The participants freely express ideas, thoughts, opinions. Ideas are not subject to criticism during the meeting, in fact the adverse judgement of ideas must be withheld until later (*deferring judgement* [18]).

[4] http://www.w3.org/TR/rdf-sparql-query/

– *Synthesis.* The moderator summarizes the generated ideas, uses various criteria to stimulate participants to assess and select the best ideas. At this stage combinations and improvements of ideas are seeked. In addition, participants should suggest how the ideas of others can be turned into better ideas or how two ideas can be merged into new ones.

In order to define a digital environment able to support Brainstorming sessions as we have defined them above, the *Knowledge Forum* [4] can be exploited to support the creation and the continuous improvement of knowledge. To facilitate discussion, and therefore the transparency of the communicative intention of each author, the *Knowledge Forum* provides some predefined linguistic structures called *scaffolds*, through which it is possible to identify a set of descriptors of thought (*thinking types*), e.g. `my theory`, `need to understand` and so on.

In our model the use of three different *scaffolds* is proposed in order to sustain the main phases of a brainstorming session: *Idea Generation*, *Knowledge Construction* and *Revision Circle*. The first one covers the *Activation* and the *Production* phases of the Brainstorming session. While, the second one and the third one cover the *Synthesis* phase. Figure 1 shows the list of the *Thinking Types* for each considered scaffold.

Scaffold Name	***Thinking Types***	***Description***
Idea Generation	Issue, **Preliminary Idea**, Advancer, Question, Answer, Free Thought, **Updated Idea**	The moderator introduces the problem issue and provides advancers to smoothly guide the discussion. The participants take part freely in the discussion by proposing new preliminary ideas. The moderator encourages the participants' interventions supporting divergent thinking. Participants can also post free thoughts and update their preliminary ideas. Questions and answers are admitted in this phase in order to support the discussion.
Knowledge Construction	Evaluation, Binding, Explanation, Question, Answer, Example, Warning, **Evolved Idea**	The participants, led by the moderator, assess the ideas on the basis of the criterion of feasibility by describing plausible examples, bringing out the relations among the ideas, organizing ideas according to the identified relations, converge on the most promising ideas and, if necessary, make the ideas evolving. Questions, answers and explanations are admitted in this phase in order to support the discussion.
Revision Circle	Criticism, Promotion, Refinement, Synthesis, Decision, **Packaged Idea**	The moderator and the participants synthetize and refine the most promising ideas by developing convergent thinking (through criticisms, promotions) that brings to a final decision and to a set of packaged ideas.

Fig. 1. Scaffolds and Thinking Types for the proposed Brainstorming Model.

2.2 A SIOC Overview

The **SIOC** initiative aims to enable the integration of online-community information. For instance, users create posts (`sioc:Post`) organized in forums

(`sioc:Forum`), which are hosted on sites (`sioc:Site`). These concepts are sub-classes of higher-level concepts that were added to SIOC: `sioc:Item`, `sioc:Container` and (`sioc:Space`. The `sioc:has_reply` property links reply posts to the content to which they are replying, the `sioc:has_creator` property links user-generated content to its authors, and the `sioc:topic` property points to a resource describing the topic of content items. The SIOC Type module introduces new sub-classes for describing different kinds of Social Web objects in SIOC. In addition, the module points to existing ontologies suitable for describing details on these objects. For instance, a `sioc_t:ReviewArea` might contain reviews asserted by using **Review RDF** [5] that is a domain specific vocabulary used to describe the main properties of a review. The most important classes are `rev:Review`, `rev:Feedback` and `rev:Comment`, while the important properties are `createdOn`, `hasReview`,`rating` and `reviewer`. The link between an instance of a `sioc:Post` and a review (an instance of the `rev:Review` class) is realized by the property `rev:hasReview` (`rdfs:Resource` as range and `rev:Review` as domain). The ReviewRDF scheme is important for the BrainSIOC in order to handle ratings on ideas during the last phase of a brainstorming session (i.e. Synthesis) when the most promising ideas are evaluated, selected and packaged (described more formally).

SIOC can be used in combination with other Semantic Web-based schemes. First of all, **SCOT** (Social Semantic Cloud of Tags) [7] can be used to model tagging operations. SCOT aims to describe the structure and the semantics of *tagging data* and to offer social interoperability for sharing and reusing tag data and representing social relations amongst individuals across different sources. The `scot:Tag` class is used to manage tags. SCOT also enables the modeling of some aspects regarding *who* uses a specific tag. In fact, the property `scot:usedBy` links a tag to a specific user. An instance of `sioc:Post` can be tagged by using the `scot:hasTag` property, or conversely by using the `scot:tagOf` property with domain `scot:Tag` and range `sioc:Item` (a subclass of `sioc:Item`). SCOT can be also integrated with the **MOAT** (Meaning Of A Tag) [6] ontology that provides a mechanism to enrich data regarding tags by considering their *meaning*. Tagging ontologies are particularly useful in the context of BrainSIOC because they improve findability of ideas across brainstorming sessions. Moreover tagging ontologies allow to simply correlate ideas with any kind of user-generated content. The SIOC ontology follows this practice by reusing the **FOAF** vocabulary [7] to describe person-centric data. A person (described by `foaf:Person`) will usually have a number of online accounts (`sioc:UserAccount` that is a sub-class of `foaf:OnlineAccount`) on different online-community sites. FOAF allows to model a social network where persons' profiles are linked together by using the `foaf:knows` property between two instances of `foaf:Person` class. In the end, **SKOS** (Simple Knowledge Organization System)[8] is a Semantic Web

[5] http://vocab.org/review/terms.html
[6] http://moat-project.org/
[7] http://www.foaf-project.org/
[8] http://www.w3.org/TR/ skos- primer/

scheme used to build taxonomies and controlled vocabularies. For the aim of this work, SKOS will be used to model a controlled vocabulary of contexts of interest in a given organization using `skos:narrower` and `skos:broader` properties to relate instances of `skos:Concept`. SKOS can be used in order to construct controlled vocabularies and taxonomies for topics in SIOC to be linked to instances of `sioc:Post` or `sioc:Item` by means of the `sioc:topic` property. SKOS can improve knowledge sharing and correlation processes across different collaboration/communication sessions and tools. By linking FOAF, SIOC, SCOT/MOAT and SKOS it is possible to enrich a person's (a worker in the Enterprise context) profile with the generated ideas, the used tags, etc. in order to foster people search operations.

2.3 The BrainSIOC ontology

The **BrainSIOC** ontology extends the SIOC ontology to support the brainstorming sessions described in Section 2.1 and scaffolds and thinking types illustrated in Figure 1. In order to define the aforementioned extension, several schemes have been considered. In particular, the attention has been focused on *Argumentative Discussion* schemes [17]. Among the others, **IBIS OWL** and **DILIGENT** are relevant for the aims of this work. The IBIS OWL Model is a RDF representation of IBIS, providing URIs for terms regarding argumentations. DILIGENT is primarily a methodology for engineering an ontology; the acronym comes from certain letters in the phrase *DIstributed, Loosely-controlled and evolvInG*. Other interesting works are **Idea Ontology** [15] and **SWAN/SIOC** [17]. The first one introduces an ontology to represent ideas. This ontology provides a common language to foster interoperability between tools and to support the idea life cycle. Through the use of this ontology additional benefits like semantic reasoning and automatic analysis become available. With respect to the aforementioned work, BrainSIOC does not cover the whole idea life cycle management but it proposes a model to represent and support the activities in the context of brainstorming sessions by exploiting a modelling approach similar to those presented in [15]. The second one is a domain-dependent scheme modelling scientific discourses using Semantic Web-based approaches.

First of all, the BrainSIOC ontology considers two roles for the brainstorming activity, i.e. the generic participant and the moderator. In order to model the first one we need to define the `bsioc:Participant` class as a subclass of `sioc:Role`. While the class `bsioc:Moderator` is defined by subclassing `bsioc:Moderator`. An instance of `sioc:UserAccount` is linked to a specific role by using the `sioc:funcion_of` property (its inverse is `sioc:has_function`). The link between a moderator and a specific container (e.g. a forum) can be also asserted by using the `sioc:has_moderator` property with domain `sioc:Forum` and range `sioc:UserAccount`. Furthermore a brainstorming session is modelled by subclassing the `sioc:Forum` class and defining the `bsioc:Brainstorming` in order to reuse all the properties defined for `sioc:Forum`. Figure 2 provides the list of the other classes defined in the BrainSIOC ontology (`bsioc` namespace). In particular, there are correspondences between BrainSIOC classes and both IBIS

Class	Superclass	Subclasses	Description	Phase
bsioc:Advancer	*bsioc:Argument*		An advancer message anticipates the problems or provides additional information that should guide the discussion.	Idea Generation
sioc_t:Answer	*sioc:Post*		The moderator or the participants provide answers to previously asked questions.	Idea Generation, Knowledge Construction
bsioc:Argument	*sioc:Post*	*bsioc:Issue, bsioc:Advancer, bsioc:FreeTought*		
bsioc:Binding	*bsioc:Elaboration*		The participants find and express correlations among ideas.	Knowledge Construction
bsioc:Criticism	*bsioc:Position*		A criticism is the opposite of a promotion for a specifica idea. At this stage, a criticism can be brought out to refine or to reject an idea.	Revision Circle
bsioc:Decision	*sioc:Post*		The moderator takes into account the rating, the refinement and synthesis of ideas and provides a place for a decision (selected or rejected) on any single idea.	Revision Circle
bsioc:Elaboration	*sioc:Post*	*bsioc:Synthesis, bsioc:Binding, bsioc:Refinement*		
bsioc:Evaluation	*bsioc:Justification*		The participants evaluate a preliminary or a updated idea by providing a judgment.	Knowledge Construction
bsioc:EvolvedIdea	*bsioc:Idea*		The participants can make progress with respect to a definition of an idea.	Knowledge Construction
bsioc:Example	*bsioc:Justification*		The participants propose a real world example of an idea in order to demonstrate its feasibility.	Knowledge Construction
bsioc:Explanation	*bsioc:Justification*		The participants give further explanation about an idea, a binding, an example, etc. An explanation could be (or not be) inducted by a question.	Knowledge Construction
bsioc:FreeThought	*bsioc:Argument*		Free thoughts expressed by the participants in order to share intuitions, opinions, insights, etc. that are not yet formalized as ideas.	Idea Generation
bsioc:Idea	*sioc:Post*	*bsioc:PreliminaryIdea, bsioc:UpdatedIdea, bsioc:EvolvedIdea, bsioc:PackagedIdea*		
bsioc:Issue	*bsioc:Argument*		The issue (proposed by the moderator) to be faced in the specific brainstorming session.	Idea Generation
bsioc:Justification	*sioc:Post*	*bsioc:Evaluation, bsioc:Explanation, bsioc:Example*		
bsioc:PackagedIdea	*bsioc:Idea*		Selected ideas are better detailed and formalized to become packaged ideas.	Revision Circle
bsioc:Position	*sioc:Post*	*bsioc:Criticism, bsioc:Promotion*		
bsioc:PreliminaryIdea	*bsioc:Idea*		Preliminary ideas proposed by participants in response to an issue.	Idea Generation
bsioc:Promotion	*bsioc:Position*		A participant can promote a promising idea in order to stimulate other participants to refine it.	Revision Circle
sioc_t:Question	*sioc:Post*		The moderator or the participants ask for clarifications or deepening.	Idea Generation, Knowledge Construction
bsioc:Refinement	*bsioc:Elaboration*		The participants can provide some refinement to a specific idea. Typically, a refinement occurs after a promotion.	Revision Circle
bsioc:Synthesis	*bsioc:Elaboration*		Promotions, criticisms and refinements could be carried out to merge two or more ideas. This operation is realized by provide a synthesis.	Revision Circle
bsioc:UpdatedIdea	*bsioc:Idea*		Modifications to preliminary ideas bring to life updated ideas.	Idea Generation
bsioc:Warning	*sioc:Post*		The moderator brings out some problems or disputes related to the ideas already proposed, the correlations between ideas, and examples provided.	Knowledge Construction

Fig. 2. Classes of the BrainSIOC ontology.

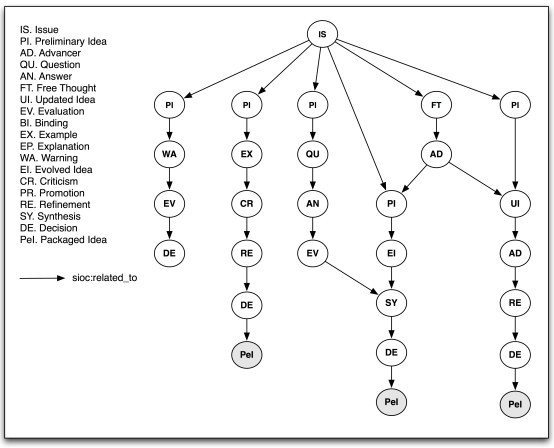

Fig. 3. A sample instance of the BrainSIOC ontology.

OWL and DILIGENT: `sioc_t:Question` is related to IBIS `ibis:Question`, `bsioc:Evaluation` is related to DILIGENT `Evaluation`, `bsioc:Example` is related to DILIGENT `Example`, `bsioc:Decision` is related to IBIS `ibis:Decision`, `bsioc:Idea` is related to IBIS `Idea`. Furthermore, we need to define new properties to be added to the BrainSIOC ontology. In SIOC, there exist several properties that are useful to link instances of `sioc:Item` (and hence of `sioc:Post`) to each other. In particular, the `has_reply` property is used to relate two items, while the `sioc:reply_of` property is its inverse. Both the aforementioned properties are defined as sub-properties of `sioc:related_to` that is adopted in the BrainSIOC. Another useful property is `sioc:next_version` that can be used to link two different versions of the same item. In the end, the `sioc:content` property (with domain `sioc:Item` and range `rdfs:Literal`) is used to store the text representing ideas, questions, answers and so on. Figure 3 illustrates an instance of the BrainSIOC ontology that shows the generation of some ideas in response to a proposed issue. The example illustrates how to the brainstorming takes place across several threads and how ideas evolve step by step until becoming a packaged idea or aborting.

3 Knowledge Discovery in Brainstorming Sessions

In this section, two knowledge discovery modalities in brainstorming sessions are described. The first one deals with discovering correlated ideas across brainstorming sessions. The second one concerns with the capability of BrainSIOC, being based on the Semantic Web stack, to provide high interoperability among people and applications while accessing, retrieving and sharing knowledge in standard way. Figure 4 shows both the modalities also explained in 3.1 and 3.2.

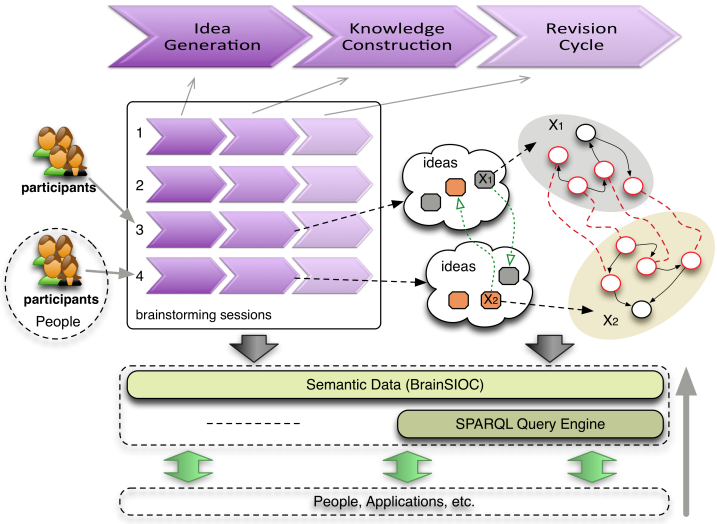

Fig. 4. Knowledge discovery in brainstorming sessions.

In Fig. 4, four brainstorming sessions are considered. For each session there is a group of participants taking part in the brainstorming. The sessions are disjoint except for the *Knowledge Construction* phase where correlations among ideas are discovered (see section 3.1) in order to unlock the independent sessions by providing external stimuli represented by similar ideas coming from other sessions.

3.1 Discovery of correlations among Ideas

In order to satisfy the requirement described in Section 1 regarding the need for correlating ideas, an approach to discover similar ideas across multiple brainstorming sessions (and to suggest these correlations to the participants) is proposed. During the *Knowledge Construction* phase, for a given idea A (an instance of the `bsioc:Idea` class), the literal associated with the `sioc:content` is compared with other ideas coming from other brainstorming sessions. The ideas A_1, A_2, ... , A_n more similar to A are suggested to the participants of the brainstorming sessions where A is emerged (in Figure 4, X_1 and X_2 are similar, so they are respectively suggested to sessions 4 and 3). The proposed approach is based on the application of the **DegExt** algorithm to build a graph representation of a single idea. In order to calculate the similarity, a distance measure that computes the distance between graphs is exploited. A threshold passing value must be considered in order to select only the most similar idea couples.

Furthermore, we suggest to rank the idea couples that pass the threshold using a measure of diversity between the two idea proposers. The bigger the diversity value, the greater the rank value. This approach is supported by scientific and methodological approaches concerning the team building approaches. In particular, in [13] and [6] it is emphasized that highly heterogeneous workgroups (diversity of competencies, skills, knowledge, culture, etc.) are more performant and effective with respect to the idea generation tasks. The diversity measure can be calculated by using the FOAF profiles of the idea proposers and applying some distance measure. The correlations, that are automatically elicited and accepted by participants after a discussion, can be asserted through the use of the new reflexive property `bsioc:correlated_to` that is defined by subclassing the `sioc:related_to` property. DegExt [8] is an unsupervised, graph-based, cross-lingual word and keyphrase extractor. DegExt uses graph representation based on the simple graph-based syntactic representation of text, which enhances the traditional vector-space model by taking into account some structural content features. The simple graph representation provides unlabeled edges representing order-relationship between the words represented by nodes. The stemming and stopword removal operations of basic text preprocessing are executed before constructing the graph. A single vertex is created for each distinct word, even if the word appears more than once in the text. Thus, each vertex label in the graph is unique. Edges represent order-relationships between two terms: there is a directed edge from A to B if an A term immediately precedes a B term in any sentence of the document. The syntactic graph-based representations were shown by Schenker et al. [16] to perform better than the classical vector-space model on several clustering and classification tasks. The most connected nodes in a document graph are assumed by DegExt to represent the keywords. When document representation is complete, every node is ranked by the extent of its connectedness with the other nodes, and the top ranked nodes are then extracted. Intuitively, the most connected nodes represent the most salient words. According to the above representation, words that appear in many sentences that diverge contextually will be represented by strongly connected nodes. DegExt is convenient for the aim of our work because it is relatively cheap in terms of processing time (linear computational complexity) and memory resources while providing nearly the best results for the two above text mining tasks and it does not require training. In order to exploit the result of the DegExt algorithm a distance measure between graphs has to be adopted. In particular, the measure proposed in [16] is considered:

$$dist_{MCS}(G_1, G_2) = 1 - \frac{mcs(G_1, G_2)}{\max(|G_1|, |G_2|)} \tag{1}$$

where G_1 and G_2 are graphs representing ideas (constructed by using DegExt algorithm applied on the `sioc:content` property of instances of the `bsioc:Idea` class), $mcs(G_1, G_2)$ is their maximum common subgraph, max(...) is the standard numerical maximum operation, and |...| denotes the size of the graph that can be taken as the number of nodes and edges contained in the graph. The

computation of *mcs* can be accomplished in polynomial time due to the existence of unique node labels in the considered application. The proposed method provides more accuracy with respect to traditional methods based on numerical feature vectors because it considers the order in which terms appear, where in the document the terms appear, how close the terms are to each other, etc.

3.2 Querying on BrainSIOC

In order to demonstrate the effectiveness of the Semantic Web stack to model, represent and integrate data, a simple SPARQL query able to find, across all brainstorming sessions, all packaged ideas annotated with the tag "Social Web"is listed here.

```
select ?title, ?content, ?topic
where
 {
    ?s a bsioc:PackagedIdea.
    optional { ?s dc:title ?title }.
    ?s sioc:content ?content .
    optional { ?s sioc:topic ?topic .
                  ?topic rdf:type skos:Concept .
                  ?topic skos:prefLabel "Social Web" }
  }
```

In particular, the above query foresees the use of the Dublin Core[9] property namely `dc:title` and the use of SKOS to define a shared (across all brainstorming sessions) controlled vocabulary in order to tag the posts. Moreover, this simple query envisages the capability of BrainSIOC to enable the integration of brainstorming sessions with collaborative working and learning scenarios in order to foster and improve knowledge maturing and knowledge sharing processes within the Organizations.

4 Conclusions and Future Works

This work proposes an approach consisting in *i*) a novel Brainstorming Model implemented by extending the SIOC ontology and defining BrainSIOC, *ii*) a technique based on the application of the DegExt algorithm to automatically discover correlations among ideas across multiple brainstorming sessions. The approach will be experimented and exploited in the ARISTOTELE project (which also foresees the development of a tool implementing the BrainSIOC) by also considering the competencies that may be developed by the participants during brainstorming sessions.

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[9] http://dublincore.org

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