

A Collaborative Process of Decision Making in the Business Context based on Online Questionnaires

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Abstract—This article is a component of a series of articles and scientific researches conducted by the research team which deals with the web 2.0 and its interactions with the different technology areas. During recent years, the emergence of the web 2.0 has revolutionized the world of new technologies, in particular the business intelligence field, providing businesses with new and innovative ways to make use of information in order to improve their overall performance. This article comes to consolidate the profit which can be taken from the new technologies of the web 2.0, especially blogs which constitute a valuable mean to gather exchanged information and results of the collaboration between users, by offering a new collaborative tool for decision making based on online questionnaires in order to exploit the collective intelligence which represents a very important source of significant data, and by adopting the SCAMMPERR method, a creative technique of stimulation of ideas and problem solving.

This paper presents a practical innovation in the computing level and makes an impact on the economic and the organizational sides of the enterprise, by proposing a new methodology based on the SCAMMPERR technique and supported by the strengths of the web 2.0 to ensure a collaborative decision making. As a result, it provides relevant decisions which support the traditional decision support systems.

Keywords—Decision Making; Web 2.0; Blogs; Business Intelligence; SCAMMPERR Method; Online Questionnaire

I. INTRODUCTION

Enterprises increasingly need to maintain and manage their competitiveness, enhance their market share, develop the loyalty of their customers, and optimize their processes and costs. To meet these needs, business intelligence was born.

Nowadays, organizations are more and more demanding and the needs are more important in terms of data constituting the basis of decisions, and the quality and the relevance of these data.

Web 2.0 is a major source of information and new technologies. Since its emergence, it has revolutionized the

world of business intelligence as any other technology sector, offering new concepts and techniques as well as various sources of data, which influenced traditional methods of decision making which is becoming a difficult task for business leaders due to the increase of the number of companies and consequently, the competition becomes more and more hard, which makes the search for more innovative ways of decision making, based on adequate data, a primary case. A new way appears, exploit the tools of the web 2.0 and the variety of its resources to enrich the sources of data of the organization and as a result, improve the decision-making process. Among these resources, blogs constitute a precious way of collection of information results of the exchange and the collaboration between the internet users. The proposed solution enhances the advantage taken from this technology, by associating it to the SCAMMPERR method which is one of the most methodical and reasonable techniques of generation and stimulation of ideas as well as the resolution of problems, to provide a collaborative process of decision making.

This paper presents a new method of decision making in the business context. Its impact and its benefits concern the engineering level as well as the innovation management one. After the implementation of this solution, it provides a solid and a practical process, which allows organizations and businesses to monitor their systems and improve the process of the decision making with more meaningful and relevant decisions related to the enterprise issues and strategies in a short lapse of time, and consequently, boost and improve the overall performance of the organization.

The next section, gives a presentation of the web 2.0, followed by a section about the business intelligence and its limits. Then, we will introduce the SCAMMPERR method which constitutes the basis of this work to elaborate the collaborative process of decision making, called SCAMMPERR 2.0 and discussed in the main section of the paper. The two last sections are reserved to the modeling and the implementation of the process.

II. WEB 2.0

The term “Web 2.0” was diffused by Tim O' Reilly in 2004, more detailed later [1], to identify the participative web. What web 2.0 brings, are the progressive increase and the continuous evolution of technologies which allow more and more the participation of web users at the level of the creation of the web content. Improvements affect the material as well as the software.

Web 2.0 is a conjunction of technologies, business tactics and social skills [2], making it a social and a technological model at once and allowing to users to create web content and to follow the last updates of a website without visiting the web page source, and to developers, to quickly and easily create new web applications based on data, information and available services on the internet.

To ensure all these tasks, web 2.0 is based on a complex and diversified architecture [3], based on a permanent diffusion of approaches (providing storage, creation and diffusion capacities), such as: software server, messaging protocols, standards of navigation, content syndication and various client applications as plugins.

A website follows the web 2.0 approach if it is characterized by:

- Techniques of rich applications such as AJAX, a technique of web interface design, which allows the update without refreshing the web page [4].
- Content syndication through standard protocols: RDF, Atom and RSS, which ensures real-time diffusion of new websites information or blogs news.
- Classification by labeling to facilitate the search.
- Valid XHTML and micro-formats.
- Appropriate use of URL and REST architecture or XML web services.

Compared to web 1.0, web 2.0 has some strengths [5]: interactivity, participation and collaboration. The latter principle constitutes the basis of improving systems in different domains such as software engineering [6]. The internet user is no longer a spectator; he becomes an actor and an active contributor due to the emergence of new technologies allowing him to participate more and more in the creation of the web content.

- Social Networks: Any set of social entities, individuals or organizations, joined together by links, established through social interactions, can be considered as a social network. It is the small world which is based on the interactivity between the users and the community gathering around common points as values and passions. These last years, the social networks are more expanded and transform the curiosity to a global phenomenon [7]. Social networks are characterized by a large number of users and a variety of content and applications, such as tests and games.
- Blogs: Introduced by Justin Hall in 1994. In its simplest shape, a blog is a website with dated and published

entries on the internet, according to the inverse chronological order [8]. This is a type of website that allows you to publish articles and all types of multimedia: images, videos and sounds. The owner of the blog can also post comments and answers the questions of the visitors who can comment and contact the blogger by e-mail. In blogs, the management is collaborative because all of users participate by their own contents and interventions.

- Wikis: Refer to dynamic websites containing pages which are editable by the web users, and represent collaborative writing spaces of varied information and an effective way of sharing knowledge. Wikis are rapid because reading and editing processes are combined. A common way of using wikis is to support planning meetings: a provisional agenda is set and the URL is distributed to the participants, who do not hesitate to comment or add their own elements [9].
- RSS Feeds: Really Simple Syndication is a manner of description of data, encoded in XML and constitutes a way of automatic distribution of information on a website, by receiving news headlines published on other websites, in real-time. Also, it allows other websites to republish simply the data, what is called the content syndication. RSS is not used only to display the news of blogs, but also for any kind of data regularly updated: weather report, availability of photos, etc [2].
- Podcasts and Videocasts: Podcasts and videocasts offer new means of distribution of digital content. A podcast is an audio file to which, people can subscribe and which can be afterward transferred to an audio player. If it is attached to a movie, it becomes a videocast. The podcasting remains an exceptional innovation in the publication of contents and largely based on the simplicity of use [10].

III. BUSINESS INTELLIGENCE

Business intelligence is a set of technologies of decision-making support within a company whose purpose is to allow executives, administrators and analysts to make better decisions more quickly [11].

In the 80s, the computerization continues, but some companies began to accumulate a lot of data, hence the birth of Data Centers. Only the IT department can create reports from the data sources to help analysts and managers to take decisions. However, the information search process involves a process of type: question - answer – question, that is why the IT specialists find themselves quickly overloaded. At the beginning of the 90s, the report generation software appears, but two side effects occurred further to the birth of reporting systems:

- Systems quickly become overloaded.
- Reporting systems provide "general public" reports.

In the 90s also, many concepts, tools, simple software: quick, independent of the production system, reliable and heterogeneous, appeared. Business intelligence is born. The

architecture of the traditional decision support system is essentially based on a data warehouse as it is shown in Fig. 1.

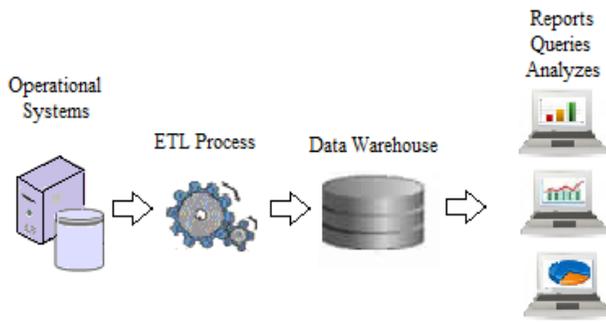


Fig. 1. Traditional business intelligence architecture

The business intelligence process includes the functions: collection, integration, distribution, presentation and administration. However, the traditional business intelligence has some limits:

- Introspective decision-making systems. Therefore, the strategic reach is very limited.
- Limit management of unstructured data.
- Techno centric approach focusing on technology.
- Very time-consuming tasks.

Also, due to the variety of people who express themselves on the web, data lack quality and relevance. Consequently, the integrity of the decision-making system is threatened. One of the major gaps is that the significant web 2.0 resources are not exploited in the ultimate ways in the field of decision-making.

That is why; and to solve problems already mentioned, it will be interesting to exploit the new inherent technologies of the web 2.0 as the collaboration, the interactivity, and the external data to enhance decision support systems with decisions based on a human centric approach and a collective intelligence reflected by the diverse collective applications, such as blogs, social networks, etc.

The collective intelligence is used in several disciplines. Here, it refers to diverse communities of people interacting to create clever outcomes [12]. So, the aim of this work is to participate to surpass the challenges facing the development of the business intelligence 2.0, which is a concept that raised a lot of questions of research to be exactly defined [13].

IV. SCAMMPERR METHOD

To guard their part of competitiveness, companies wish to seek ways of improving, in a continuous way, their products and services, which requires a high rate of imagination and innovation. Nevertheless, the creativity does not occur. It is a process that takes time and effort [14]. That is why; several researchers put a lot for the development of new techniques which fill this need, aiming to ensure the creative thinking and to solve problems for example: Hurson’s productive thinking model, the six hats of critical thinking, the reversed brainstorming, etc; though, SCAMPER or SCAMMPERR is

considered one of the structured, easiest, successful and most direct methods [15].

SCAMMPERR technique showed its effectiveness compared to the similar methods and constitutes a very rigorous and a powerful technique and at the same time, a very flexible and fast method, already implemented for experiments in important domains as education and engineering [16][17]. When talking about decision making, the most important goal is to save time and relevance, which justifies the choice of the method adopted in the process.

A. SCAMMPERR: Principle and Utility

SCAMMPERR refers to an associative method of creativity which gathers nine innovative techniques, its principle was proposed by Alex Osborn in 1953[18] and developed afterward by Bob Eberle [19] [20].

SCAMMPERR is a technique which provides a methodical and practical way of stimulation of the divergent thinking, the imagination, the originality, and the intuition [21] [22]. Each one of the letters in the SCAMMPERR acronym signifies an operation that can be applied to an idea, a concept, a project, a product or a service. The list of these operations is given in Table I [23].

TABLE I. SCAMMPERR OPERATORS

S	Substitute	components, materials, elements (ideas, people, features, services)
C	Combine	mix, combine with other ideas or services, add functions, elements or systems
A	Adapt	alter, change function, modify a part of an element, utilize a part of another element
M	Magnify	enlarge, make it enormous, higher, longer, add functions , features or additional capabilities
M	Modify	modify scale (increase or reduce it), shape (color, audio, ...), attributes (texture, design, ...)
P	Put to another use	use it in a different context, identify more usages or advantages
E	Eliminate	delete elements, components, reduce, simplify, minimize
R	Rearrange	change the order, the sequence , interchange components, change patterns
R	Reverse	turn inside out, upside down, transpose, reverse usage

Each of the nine SCAMMPERR operators can refer to several questions, of which, the ones to adapt to a specific problem can be chosen, to generate answers which constitute new ideas. Some standard examples of these questions are presented in Table II [24].

TABLE II. SCAMMPERR QUESTIONS EXAMPLES

Operator	Questions
Substitute	Can we use something else instead of this product, object, service or process?
Combine	Can we combine anything to get something new or interesting?
Adapt	Does someone else have an answer that we can adapt to our situation?
Magnify/Add	Can we make it larger, add to it or extend it ?
Modify it	Can we change or modify it in some way?
Put it to some other use	How else could our product or process be used? Does it solve some other problem?
Eliminate something	Can we eliminate something to solve our problem?
Rearrange it	Must we rearrange the current order or sequence?
Reverse it	What if we reversed it? Did the exact opposite?

B. SCAMMPERR Process

The SCAMMPERR process is based on two essential steps:

- The identification of the idea, the problem or the subject, matter of the reflection.
- The formulation of questions related to the subject using the list of SCAMMPERR operators.

SCAMMPERR questions can be exploited through:

- Systematic exploration: consists in exploring an idea, a product or a service by using all the SCAMMPERR operators.
- Depth development: iterative use of a SCAMMPERR operator in particular to find new ideas.

In general, there are two important ways to develop the SCAMMPERR method [25]:

- Generate creative ideas from a problem or a topic: using SCAMMPERR for creativity and problem solving as shown in Fig. 2.



Fig. 2. Generation of ideas from a problem

- Apply SCAMMPERR on the results of a previous technique of stimulation of ideas: it aims to filter all the resulting ideas to focus on the best ones as it is shown in Fig. 3.

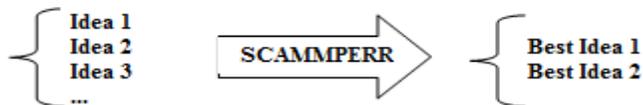


Fig. 3. Generation of ideas from the resulting ideas

In the context of the proposed process, the first method is noted SCAMMPERR1 and the second one is noted SCAMMPERR2. Here, the SCAMMPERR method is used as a way of stimulation, generation of ideas and resolution of problems launched by the company or the community.

V. SCAMMPERR 2.0: A COLLABORATIVE PROCESS OF DECISION MAKING BASED ON ONLINE QUESTIONNAIRES

SCAMMPERR 2.0 is a collaborative process, based on the good use of the web 2.0 tools. DBlog (Decisions Blog) is a blog which can be implemented on the web by the company, to present its problems and to question its marketing strategies, in order to take advantage of opinions and decisions of the customers and the community of the web, as well as to become aware of their needs and their interests, with the ultimate aim of facilitating, renovating and improving the process of the decision making. Questions on questionnaires follow the SCAMMPERR notation and depend on the nature of the treated issue or subject.

The acquisition of the opinions of users is made through an online questionnaire, appropriate to each problem or decision under process, given that the online questionnaire remains a very good way of inspection and evaluation. This online questionnaire comprises a set of questions related to the problem and following the SCAMMPERR1 reasoning, to ensure a methodical analysis. Answers (decisions of the users) undergo a SCAMMPERR2 treatment, before making the final decision. The general outline of this process is illustrated in Fig. 4.

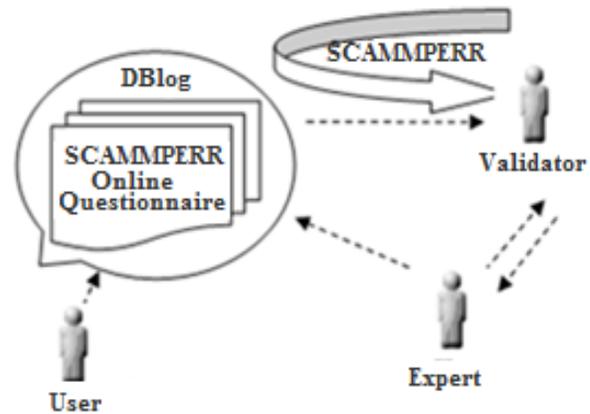


Fig. 4. General outline of the associative process

A. Categories of decisions

Decisions are classified into three main categories:

- Initial decision: the answer of a user for each SCAMMPERR question.
- Preliminary decision: decision of a validator after SCAMMPERR2.
- Final decision: decision of the expert after reviewing the decisions of the validators.

Every decision receives a score on 10 and follows the scale represented in Table III.

TABLE III. SCALE OF SCORES

Score	Signification
[1 – 3]	Low quality
[4 – 6]	Average quality
[7 – 8]	Good quality
[9 – 10]	Strategic Decision

B. Categories of users

Five categories of users interact in the system as shown in Table IV.

TABLE IV. CATEGORIES OF USERS

Actor	Signification	Eligibility
User	Simple user	<=5
User Plus	User	<=5 and client of the company
Validator	Validator of SCAMMPERR1 and actor of SCAMMPERR2	[6 – 9]
Validator plus	Validator of SCAMMPERR1 and actor of SCAMMPERR2	[6 – 9] and employee of the company
Expert	Monitor	= 10

The maximal value that the eligibility can reach is 10, given that: the maximal sum of the scores that can a user reach for each questionnaire is 90, with a score of 10 for each of the nine SCAMMPERR questions.

User eligibility is a parameter which reflects its decisional relevance. It is a factor that will be used to manage the promotion of users and it is expressed by the following equation:

$$Eligibility = \frac{\sum Scores}{\sum Decisions} \quad (1)$$

A degree of Influence is assigned to each user according to its category to designate the weight of its decisions as shown in Table V.

TABLE V. DEGREES OF INFLUENCE

Actor	dInf (Degree of Influence)
User	1
User Plus	2
Validator	4
Validator plus	6

C. Process of Collaborative Decision Making following SCAMMPERR

There are eight stages in the process:

- Step 1: One of the experts of the system develops the problem to solve or the decision to discuss. Then, he elaborates the associated questionnaire following SCAMMPERR notation. The user can start a process by proposing an idea; in this case the expert will take care of the rest.
- Step 2: The expert publishes the online questionnaire on the DBlog.
- Step 3: Users answer the questions of the online questionnaire.
- Step 4: The expert chooses three validators related to the topic of the problem.
- Step 5: The expert generates the matrix of the initial decisions.
- Step 6: The validators evaluate the initial decisions for the management and the promotion of users and apply SCAMMPERR2 to the matrix.
- Step 7: The validators make preliminary decisions.
- Step 8: The expert examines the preliminary decisions and makes the final decision.

The process is illustrated in Fig. 5.

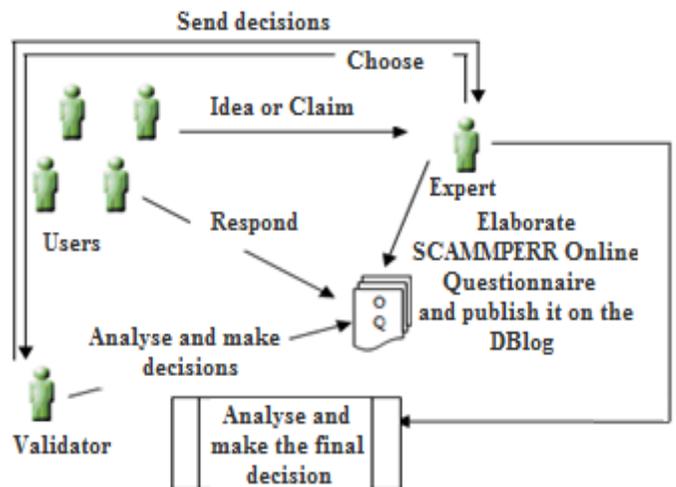


Fig. 5. General process of SCAMMPERR 2.0

When the SCAMMPERR questionnaire is online, users start to fill it. Once a considerable sum of filled copies is reached (as needed), the expert develops a matrix which comprises the diverse initial decisions.

The matrix takes the following form:

$$M(U, O) = \begin{pmatrix} d_{1S} & \dots & d_{1R} \\ \vdots & \ddots & \vdots \\ d_{NS} & \dots & d_{NR} \end{pmatrix} \quad (2)$$

Where: d_{UO} is the initial decision of the user U for the SCAMMPERR operator O .

The validators give a mark to initial decisions (a score going from 1 to 10). Afterward, they calculate the degree of relevance of every initial decision, based on the following formula:

$$dR(d_{UO}) = S(d_{UO}) * dInf(U) \quad (3)$$

Where:

- $dR(d_{UO})$ is the degree of relevance of the decision d_{UO}
- $S(d_{UO})$ is the score assigned to the decision d_{UO}
- $dInf(U)$ is the degree of influence of the user U

The degree of Influence of the user, the score of the decision and its degree of Relevance are three parameters which facilitate the application of the SCAMMPERR method by validators, which will allow making a first classification of the initial decisions before applying SCAMMPERR2, as well as for the expert during the evaluation of the preliminary decisions of validators.

After SCAMMPERR2, every validator extracts from the matrix of initial decisions, a SCAMMPERR vector containing nine decisions related to the SCAMMPERR operators.

$$v(V) = (d_{VS}, d_{VC}, d_{VA}, d_{VM}, d_{VM}, d_{VP}, d_{VE}, d_{VR}, d_{VR}) \quad (4)$$

The expert evaluates the decisions of the three validators according to their degree of Influence and the degree of Relevance of their decisions, and makes the final decision.

VI. MODELING

To model the system, the object modeling using UML (Unified Modeling Language) [26] is used. It proposes a rich set of different diagrams [27].

The modeling of the system comprises a use case diagram and a sequence diagram.

A. Use Case Diagram

Use case diagrams allow representing, in a simple way, the fundamental needs and the objectives of the system from an external point of view to it. The use case diagram is represented in Fig. 6.

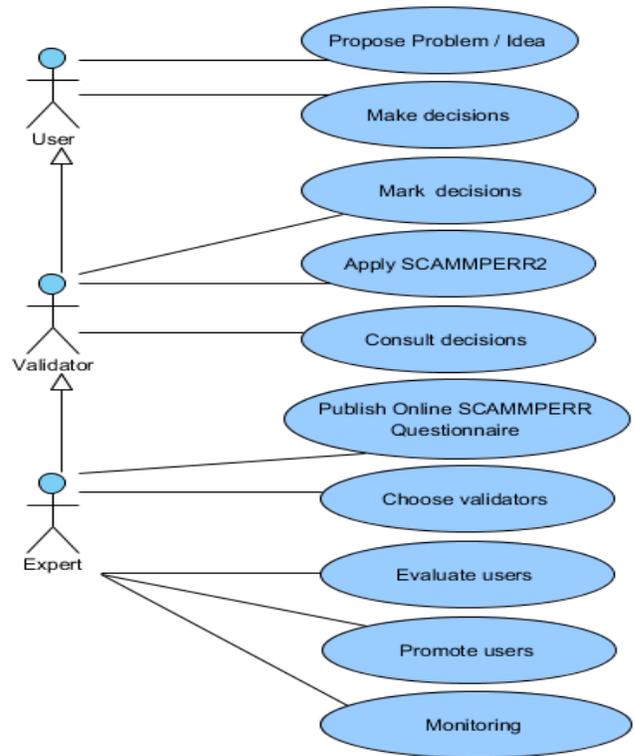


Fig. 6. Use case diagram of SCAMMPERR 2.0

The system has three main actors:

- User: a simple user or a user plus. He is the user of the internet platform, his main role is to make initial decisions by filling SCAMMPERR questionnaires posted by the company, as he can trigger the treatment of an issue or propose an idea.
- Validator: validator or validator plus, his mission is to evaluate the decisions of users by applying SCAMMPERR2 to initial decisions. Subsequently, he takes preliminary decisions.
- Expert: manages all the platform, develops the SCAMMPERR questionnaire, puts it online, collects the initial decisions and evaluates the preliminary ones to manage the promotion of the users and makes the final definitive decision. He is also the one who chooses the validators for each SCAMMPERR process.

B. Sequence Diagram

This diagram is mainly designed to represent the interactions between objects that communicate with each other

by sending messages. The sequence diagram is represented in Fig. 7.

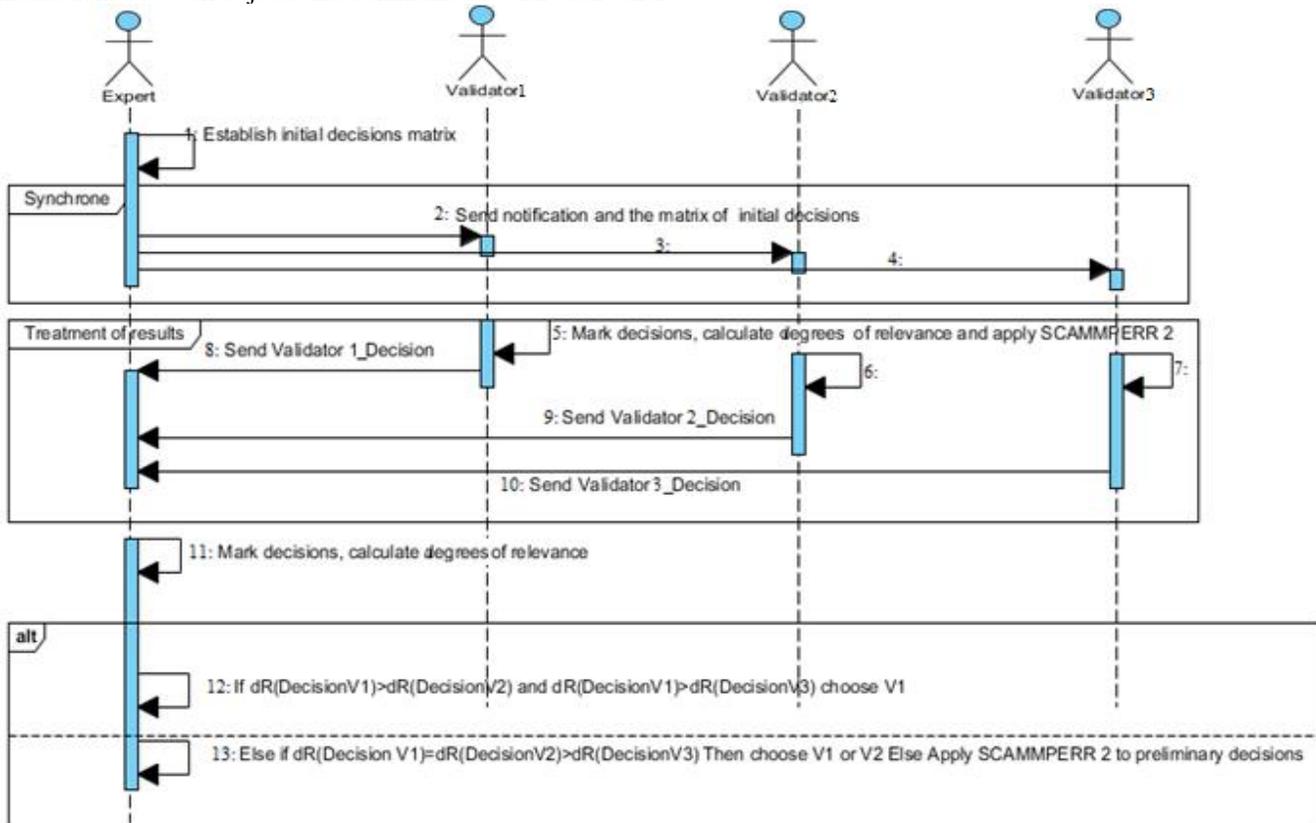


Fig. 7. Sequence diagram of the step of results treatment

After receiving the results, the expert establishes the matrix of the initial decisions, chooses three validators of the domain of the subject or the problem, and sends to them a notification of choice with information about the mission, accompanied by the matrix of the initial decisions. The validators assess decisions (nine decisions by user), then calculate their degrees of Relevance, according to which, the decisions are classified in decreasing order for every SCAMPERR operator. These decisions will subsequently undergo a SCAMPERR2 process, for example:

- Eliminate those with a low dR.
- Keep those which have a high dR as reference to which adapt (Adapt) those having a lower but a reasonable dR, or to mix them (Combine), with other decisions with a lower dR.
- The good decisions but which are badly positioned regarding to the handled subject, can be modified (Modify) or (Put to another use) for subsequent questionnaires.

Therefore, every validator makes a decision based on SCAMPERR2, for every SCAMPERR operator, which forms a vector of preliminary decisions to transmit to the expert, who evaluates the decisions of the three validators and calculates their dR before making a final decision, for example:

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IF dR(Decision(V1)) > dR(Decision(V2)) and
dR(Decision(V1)) > dR(Decision(V3)) THEN choose
Decision(V1)
ELSE IF dR(Decision(V1)) = dR(Decision(V2)) >
dR(Decision(V3)) THEN choose Decision(V1) or Decision(V2)
ELSE Apply SCAMPERR2 to preliminary decisions
    
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VII. USE CASE

A company wants to change its advertising slogan, or create a new one. An expert in the field is convened, he can be an employee of the enterprise or not.

The expert develops a SCAMPERR questionnaire which corresponds to the problem and publishes it on the DBlog of the company which can be reached from the official site or from all the types of social platforms of the web 2.0.

The representation of the online questionnaire is illustrated in Fig. 8.

What about a new slogan?

Thanks for your collaboration !

* Required

S: What can be replaced in this slogan? *

A: Which slogan you like and we can adapt? *

C: Could we merge two old slogans? *

M: What can we add to improve our slogan? *

M: Can we change the meaning of the slogan? *

P: How else could our slogan be used? *

E: What do you propose to eliminate? *

R: What if we reverse it? *

R: Must we rearrange the current order of words? *

Fig. 8. A SCAMMPERR online questionnaire about a Slogan renovation process

After a certain period, the expert filters the results and creates a matrix of initial decisions. As for an example of 5 users, results are shown in Table VI.

TABLE VI. MATRIX OF INITIAL DECISIONS

User	Decisions
User 1	(d _{1S} , d _{1C} , d _{1A} , d _{1M} , d _{1M} , d _{1P} , d _{1E} , d _{1R} , d _{1R})
User 2	(d _{2S} , d _{2C} , d _{2A} , d _{2M} , d _{2M} , d _{2P} , d _{2E} , d _{2R} , d _{2R})
User 3	(d _{3S} , d _{3C} , d _{3A} , d _{3M} , d _{3M} , d _{3P} , d _{3E} , d _{3R} , d _{3R})
User 4	(d _{4S} , d _{4C} , d _{4A} , d _{4M} , d _{4M} , d _{4P} , d _{4E} , d _{4R} , d _{4R})
User 5	(d _{5S} , d _{5C} , d _{5A} , d _{5M} , d _{5M} , d _{5P} , d _{5E} , d _{5R} , d _{5R})

The corresponding matrix is:

$$M(U, O) = \begin{pmatrix} d_{1S} & \dots & d_{1R} \\ \vdots & \ddots & \vdots \\ d_{5S} & \dots & d_{5R} \end{pmatrix} \quad (5)$$

The matrix is transferred to the validators, who each, gives a mark for every decision and calculates its degree of Relevance taking into account the degree of Influence of each user.

As an example, the validator 1 establishes the results summarized in Table VII.

TABLE VII. SCORES AND DR OF INITIAL DECISIONS

User	dInf	Scores	dR(Decisions)
1	1	(5,6,7,9,7,7,8,5,7)	(5,6,7,9,7,7,8,5,7)
2	2	(6,4,6,6,2,7,5,7,8)	(12,8,12,12,4,14,10,14,16)
3	1	(7,8,6,9,5,8,8,8,9)	(7,8,6,9,5,8,8,8,9)
4	1	(1,3,4,4,2,1,2,3,3)	(1,3,4,4,2,1,2,3,3)
5	2	(9,9,9,7,9,9,9,8,9)	(18,18,18,14,18,18,18,16,18)

In the case of the substitution operation with the operator S, the obtained results are shown in Table VIII.

TABLE VIII. ACTIONS FOR THE SUBSTITUTION OPERATOR

User	dR of Substitute Decision	Actions
1	5	Eliminate
2	12	Mix with D(User5)
3	7	Save it if it is good for another purpose
4	1	Eliminate
5	18	Mix with D(User2)

The process is the same for all the operators, so a single decision is obtained for every operator. Thus, the result is a single SCAMMPERR vector by validator. Then, the expert assesses these three decisions and chooses the most relevant as definitive decision. Also, he can combine the two best decisions to obtain the final one, or apply SCAMMPERR2.

VIII. CONCLUSIONS AND FUTURE WORKS

Nowadays, the evolution of the web affects all areas and in particular, the approach of the decision making. In this paper, the objective of the proposed method is to find a way that promotes the combination of the web 2.0 and the business intelligence concepts by providing a new mechanism of decision making based on the integration of new technologies and tools of web 2.0.

This new system allows involving web users in the decision-making process of the enterprise, which generates a decision based on a collective intelligence strengthened by the use of a rigorous method of stimulation and generation of ideas. Thus, get more innovative and more relevant and fast decisions. The general process provides an independent and a flexible tool to generate significant decisions based on the exploitation of the web 2.0 data, especially through the social channels such as social networks, blogs, etc. The process of the generation of decisions is characterized by a reduced time execution on demand and as needed. So, it can be executed at any time to get fast and relevant decisions. The strength of this

tool resides in the fact that it brings benefits on several levels, namely the technical, the economic and the organizational levels of the enterprise. So the decisions reached are more relevant, which helps in improving the overall performance of the organization.

As perspectives, the aim is to generalize the use of this tool by adapting it to other areas and other web 2.0 platforms. Also, to plan to extend the research by handling other components like semantics and integration.

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