

Improving the idea evaluation process in creative workshops through contextualisation

A. Gabriel, M. Camargo, D. Monticolo, V. Boly

ERPI Laboratory, Université de Lorraine, ENSGSI
Nancy, France

alex.gabriel@univ-lorraine.fr, davy.monticolo@univ-lorraine.fr,
mauricio.camargo@univ-lorraine.fr,
vincent.boly@univ-lorraine.fr

M. Bourgault

Polytechnique Montréal
Montreal, QC, Canada

mario.bourgault@polymtl.ca

Abstract: Creativity workshops (i.e. brainstorming, creativity contests and design jams) are increasingly being used by organisations to explore new design spaces and find original ideas for new products or services. The selection of ideas resulting from these creative processes is a key activity for a firm, as it serves as a foundation for time management and decisions on further investments. Moreover, the selection of promising ideas has a more significant impact than the creative process itself as it colours the overall innovation process. We argue that this type of decision is strongly context dependent. That is, the selection process is conditioned by several factors such as the firm's technological and organisational capabilities and its strategy. This implies that a relevant idea for a particular company is not necessarily relevant for another. This paper proposes a context formalisation approach, supported by multi-criteria decision-making analysis tools to evaluate ideas resulting from a creative workshop. This evaluation process seeks to assist the decision-making by requiring success criteria to take into account the firm's context and priorities and give decision-makers the keys to establish a coherent evaluation. Implementation of this approach during a creative workshop validates the appeal of this type of contextual evaluation. It contributes to the field of practical application of ideas in productive environments. The proposed methodology is illustrated through a case study on the new eco-tourism services for the city of Leticia in the Amazonian region of Colombia with a view to sustainable development.

Keywords: multi-criteria decision analysis; creative workshop; idea evaluation methodology; creative process

1. Introduction

In the quest for innovation excellence, managing the creative capabilities of a company or an organisation has increasing appeal whatever the economic sector. This creativity issue is not anymore limited to the management level of the firm, it is a culture trait that should be spread over the entire organisation, beyond the design or R&D departments (Gessinger, 2009). In the context of a globalised economy with a high level of competition and challenges among companies, the ability to innovate (i.e. generate and successfully implement new solutions) is critical. This ability largely depends on the strategic policy of the firm and the implementation of an innovation process and hence a creative process. Despite the proximity of the term creativity and innovation and almost their indistinct use in many fields, a simple distinction can be done. Creativity refers to the production of ideas whereas innovation is the implementation of these ideas (Anderson et al., 2014). Obviously, as it is not possible to implement something that has not been even thought, innovation depends on creativity. In organizations, the generalized practice is to solve problems related to the current business process. A routine problem is solved by the reproduction of methods already experimented in a similar context. In opposite, a creative problem requires the creation of a new method to solve it (Mayer, 1999).

Creativity has been largely studied as an individual process. However it is also a collective and social process, especially within the organisations where creativity workshops are becoming a popular activity for fostering innovation. Moreover, firms also have external influences, as the creative process is increasingly being supported by ICTs (such as contest and crowdsourcing platforms). These workshops allow companies to explore new frontiers or design spaces, or address a particular problem that can be treated in a collective manner. Within the framework of this paper, solely the collective creative workshops will be considered, with a particular focus on the process of dealing with the output of these creative processes.

Although the evaluation and selection of ideas is a common phase in the creative process, the importance of assisting this approach has not been sufficiently developed from an operational standpoint despite a theorised methodology. Even though some common criteria such as NUF (Novel, Useful and Feasible), have been identified in literature (Kudrowitz and Wallace, 2013), there are many other studies about evaluation in literature, but they rarely use the same set of criteria for rating ideas (Dean et al. 2006). Furthermore, collective creativity is still in its early stages (Yu et al., 2012) so the theory behind idea evaluation is restricted in terms of adaptability. In this way, there is no choice in the evaluation criteria and the importance of these criteria is deemed to be the same whatever problem needs to be solved.

With each organisation having limited means and capabilities, it must '*de facto*' apply a selection process. Indeed, this selection process should be made taking into account the firm's particular context (Cluzel et al., 2016). This context has to take into account to the organisational and technological capabilities to create value for its customers. The aim of this article is to highlight the potential of a contextualization approach for the improved evaluation of promising ideas generated in creative workshops. The aim of this approach is to determine the ideas and concepts that best respond to the problem according to the information collected from the decision-maker and the use of decisional tools. As is already the case in various domains, Multi-Criteria Decision Analysis (MCDA) methods have demonstrated its ability to adapt to the context through its multidimensional nature. To sum up the intention of this article in another way, the matter can be set out as follows:

How do you coherently integrate idea evaluation into a creative workshop in order to better respond to a problem and live up to the expectations of the organisation's stakeholders?

In order to tackle this issue by the definition of a new methodology, this article will first introduce the different aspects of creative workshops with the focus on the creative process and the context formalisation. Next, during a creative workshop, the specific aspect of idea evaluation will be explored to define an evaluation approach based on Multi-Criteria Decision Analysis methods. The resulting methodology of this article will be illustrated by an example of application before being discussed. This methodology is of interest to practitioners who want some objectivity for the idea evaluation during the organisation of creative workshops.

2. Overview of the evaluation methods applied to creativity

2.1. Evaluation in creativity

Creativity is a subject that has long been studied and theorised, with Poincaré already having suggested the descriptive process for it (Lubart, 2001). Without carrying out an historical review of the creativity theories, they largely suggest an idea generation phase and an idea evaluation/

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validation/ verification phase (Salerno et al., 2015; Sawyer, 2012; Seidel, 2011; Howard et al., 2008; Nemiro, 2004). Although the matter of the creative process remains to be discussed, we will consider a creative process from a past review (Howard et al., 2008): analysis, generation, evaluation, and communication/implementation. Even Guilford, who emphasises the need to revise the 4-steps model (Lubart, 2001) introduces confrontation and evaluation into his divergent/convergent thinking framework. This evaluation plays different roles within the creative process, so it can be used for: selecting an idea from a pool of suggestions, managing the creative process (Micaëlli and Fougères, 2007), defining the next step in the creative process, changing the focus of the creative process (Bonnardel, 2006) or even evaluating the performance of applied creative technique (Oman et al., 2013). This evaluation will reflect the outcome of the creativity process, namely a formulated idea, a prototype, a drawing or even a fully developed and marketed product according to the evaluation methods. The product is one of the six strands outlined to gain an understanding of the phenomenon of creativity (Long, 2014): process, product, person, place, persuasion, and potential. All these aspects can be evaluated however, as mentioned above, and this paper is focused on the outcome of the creativity process.

Once a large number of ideas have been generated on application of creative techniques, choosing one idea from the pool is a task which implies compromise, judgement and risk (Oman et al., 2013). Different approaches are identified in the literature and Adam Westerski suggested that there are three main techniques for coping with idea selection (Westerski, 2013): idea assessment, machine-aided pre-processing, filtering and clustering of data. The idea assessment is a task performed by evaluators to enrich ideas in alignment with the organisation's goal and current needs. Filtering and clustering is composed of textual and graphical methods during idea selection so as to enhance browsing and searching in the idea pool. Examples of these methods include mind mapping or the pro/con grid. Finally, the machine-aided data pre-processing is a computational task to generate statistics or recognise patterns and pre-process an idea prior to human assessment.

Based on these typologies, the subject of this paper is assistance with idea assessment. An enriching approach, this assessment can be supported by different tools (Westerski, 2013): ranking tools, categorisation, interlinking (connecting your idea with someone else's), and textual reviews. In the upcoming sections, the ranking tools and ultimately the categorisation tools will be further explained.

To carry out this idea assessment, several methods have been created. "The most popular product assessment technique" (Long, 2014) is the Consensual Assessment Technique (CAT) (Hennessey and Amabile, 1999). This is one of the 10 methods reviewed by Sarah Oman and her colleagues (Oman et al., 2013) who also proposed two methods for creativity concept evaluation during early design: the Comparative Creativity Assessment (CCA) and the Multi-Point Creativity Assessment (MPCA). Nearly all of them are based on criteria evaluations by judges and the distinctive features are the applied criteria, the evaluation scale and the ways the data is processed.

All these idea assessment methods, idea filtering and clustering techniques require criteria. Based on the definition of the creativity as something new and adapted, several criteria have been reviewed to evaluate the creative potential of a concept or an idea. These criteria can be represented through a tree (Figure 1) inspired from a classification (Dean et al. 2006) and slightly modified in the work of Paul-Armand Verhaegen and his colleagues (Verhaegen et al., 2013). However, several modifications made in their article, such as the criteria of variety and quantity, have not been considered. These

criteria are irrelevant in the comparison of two ideas as they are designed to measure an entire set of ideas and evaluate the effectiveness of the process (Oman et al., 2013).

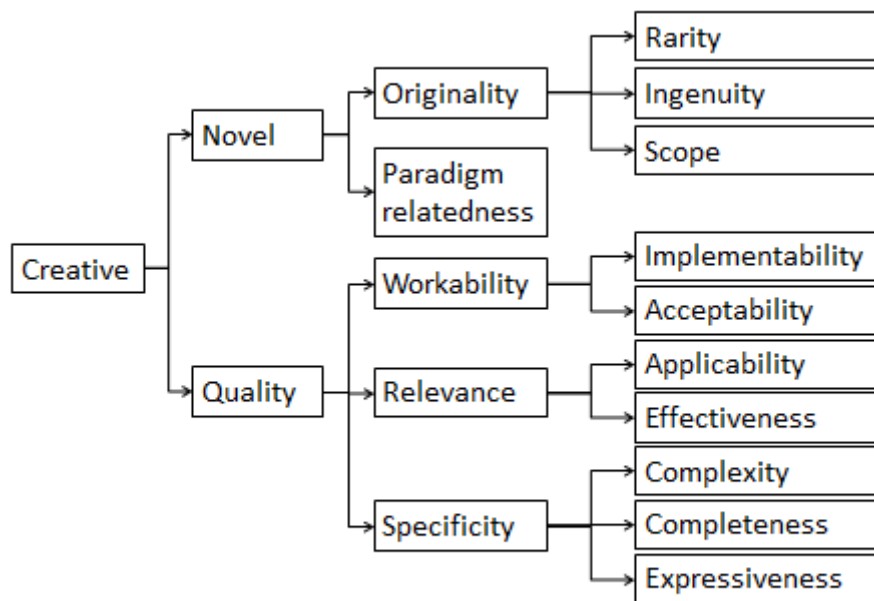


Figure 1. Overview of the idea evaluation criteria, in its adapted form (Verhaegen et al., 2013)

This taxonomy provides classes of criteria that can be directly submitted for evaluation by the evaluators, or broken down into more specific criteria, as it depends on the problem or the firm's particular domain. This domain/problem dependence is almost true for the quality aspects. For example, a study concerning the criteria used by a company for idea evaluation in an innovation context highlights seven criteria: "(i) alignment of the proposal with the company's strategy; (ii) analysis of the technical feasibility of the proposal; (iii) direct financial return on the proposal; (iv) environmental return; (v) social return; (vi) enhanced return in other projects; (vii) other intangible returns" (Correa and De Moura Ferreira Danilevich, 2015). All these criteria fit into one of the previous criteria classes. From all these classes, a criterion can be defined for each, but there is a question concerning the relevance of the criteria according to the problem and the goal of the workshop. A better evaluation results is first a better design of the evaluation (Micaëlli and Fougères, 2007). It is not possible to try to process evaluation with tools and instruments without design it. To do so, the hypothesis involves aligning the context of the workshop with the evaluation. It implies collecting the required information that will be used as reference for the evaluation. Designing a creative workshop amounts to dealing with the fact that creativity of individual is not predictable. However, even if the individual creative spark is not predictable, it does not exclude the interest to create the best conditions for its occurrence. The present interest is rather the organizational level of the creativity and eventually the collective level (Mumford, 2012). The organizational perspective of creativity deals with the creation and the improvement of the adapted conditions for optimize creativity and almost the creative production. As any management case, it requires tools to evaluate the value of the production and being able to justify improvement despite all the processes involved are not known.

Table 1 Selection of ideas evaluation studies and criteria used

Study	Nature of the study	Product-situation	Criteria involved
(Dean et al. 2006)	Situational	Increasing Tourism In Tucson	Novelty, Workability, Relevance, Specificity
(Kudrowitz and Wallace, 2013)	Artifact	Umbrellas, Toasters And Toothbrushes	Creative, Novel, Useful, Product-Product Worthy, Clear
(Gray et al., 2010)	Artifact	Diverse Design Objects	Novelty Useful Feasibility
(Liikkanen et al., 2011)	Situational	Digital Hotel Reception & Smart Gym	Novelty, Utility, Feasibility, Level Of Detail, Mode Of Presentation (MOP)
(Jagtap et al., 2015)	Artifact	Diverse Design Objects	Quality, Novelty, Variety
(Cluzel et al., 2016)	Situational	Selecting Eco-Innovative R&D Projects	Novelty, Variety, Quantity, Quality
(Correa and De Moura Ferreira Danilevicz, 2015)	Situational	Selecting Ideas Of Innovative Projects For The Electric Industry	Alignment With The Company's Strategy, Feasibility, Financial, Social And Environmental Returns
(Verhaegen et al., 2013)	Artifacts	Shavers	Quantity, Variety, Novelty, Quality

Table 1 shows recent studies on idea evaluation in creativity and though it does not pretend to be exhaustive, two main comments could be addressed: Firstly, concerning their nature, two different types of studies exist. These deal with situational problems and include artefacts that may involve drawings or event prototypes. Secondly, although some criteria such as *novelty*, are common to most of these studies, there is also criteria regarding particular areas of the problem to be solved. This last point leads us to believe that the set of evaluation criteria to be considered is strongly dependent on the specific context that needs to be formalised.

2.2. Context formalisation

In order to evaluate the relevance of an idea that attempts to respond to a problem, it is necessary to define the context of the problem and the associated context-dependent criteria. The context is composed of different elements, i.e. the organisation's industrial sector, the available skills, the strategy of the organisation and also the experience in creative workshops. The formalisation of the problem, its constraints and its needs, enables the problem to be properly outlined and so determines the set of criteria necessary to evaluate the ideas.

The idea evaluation can be assimilated to a decision situation. A decision situation supposes three things (Roy and Słowiński, 2013) - a goal which is a set of potential actions, - outlined criteria and attributes based on multiple and somehow conflicting points of view, and, - thorough knowledge of the decision context and the stakeholder that holds information. The problem of contextualisation has been dealt with various fields, for example, benchmarking problems, comparison of computer-based systems (Friginal et al., 2016), and comparison of healthcare technology management systems (de Moraes et al., 2010). They argued that without contextualising, factors such as the environment, the type of system targeted, or the evaluation performer, the same results may have different interpretations depending on the evaluator's subjectivity.

Moreover, in the ideation process, the constraints associated with the problem context serve to guide the mental representations produced to solve the problem (Bonnardel, 2006). According to his research, the fewer the number of constraints, the more difficult it is to solve the creative problem. Retrieving this information allows the actors to define the problem solving space and then represent related ideas in a mapping of the solution space. In order to decide if an idea is in the solution space or not, some information has to be collected from the organisation such as the antecedents, intents, success criteria or even the decision-making logic of the decision-maker.

The relevance of an idea will depend on the set of evaluation criteria applied, but the criteria do not always have the same importance. The level of importance (weight) of each criterion varies according to the field and the objective of the creative process. For example in the case of a technically oriented problem, ideas that respond to problem specifications are qualified as good. In the case of a product design problem, it is a bit different, as an idea can be considered to be good, even if it does not respond to the specifications of the problem (Bonnardel, 2006). More precisely, the weight of the criteria applied to evaluate the ideas may evolve according to the field. For example, in the context of furniture or website creation, originality is more valuable (i.e. 70% originality, 30% adaptability) whereas in an industrial context adaptability is more appreciated (i.e. 30% originality, 70% adaptability) (Bonnardel, 2006). All this formalisation is justified by the fact that the ‘evaluation system’ is not directly adapted to the particularity of a situation and a context, it has to be designed and adapted (Micaëlli and Fougères, 2007). Multi-Criteria Decision Analysis is a way of getting the best compromise and weighting between the different dimensions of a problem and adapt them to the particular context.

Although the problem formalisation is a prerequisite for processing the entire creative process, due to the text limitation and the focus of the article on idea evaluation, a problem formalisation methodology will not be outlined. It should be noted, as mentioned earlier, that a certain quantity of information is necessary for the evaluation process. Only the information related to the evaluation process will be outlined.

3. Proposed approach for evaluating and ranking ideas

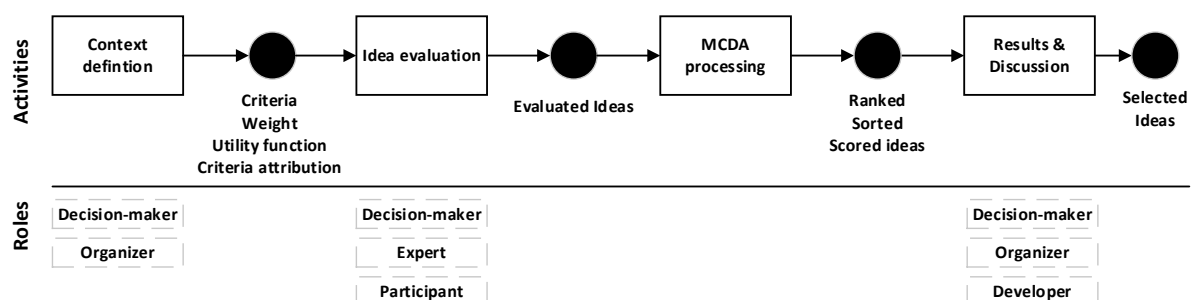


Figure 2. Representation of the evaluation approach based on a detailed creative process

“Evaluation is likely becoming even more important for organisations seeking innovation because they cannot afford to accept all the new ideas.” (Acar and Runco, 2012) To carry out this evaluation, the “Amabile’s Consensual Assessment Technique (CAT) might be regarded as a measure of the product’s creativity” (Piffer, 2012). Although evaluating the creative product through global and subjective assessment by experts can be rich in terms of feedback, it takes a long time to process the

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information generated and the most significant limitation is the lack of shared definition about a creative product among the experts. To systemise the evaluation, the present assumption is the use of Multi-Criteria Decision Analysis (MCDA) tools. Indeed, MCDA techniques allow the decision-maker to find the best compromise, because most of the time there is no single, perfect alternative to suit all the criteria required to make the evaluation. Moreover, the process of formalising the decision-making problem provides accurate information that will be valuable for understanding the problem under evaluation (Nemery et al., 2012). The evaluation can be represented as a sub-process as illustrated in Figure 2. This sub-process is based on four steps: context definition, idea evaluation, MCDA processing and discussion.

3.1 Context Definition

Context definition as explained in section 2.2 must ensure the coherence between the organisation's goal and the evaluators' preferences. During this step, four key actions must be carried out: problem assessment, definition of criteria and scales, elicitation of the degree of importance for each criterion and assignment of evaluators.

3.1.1 Problem assessment

Workshops sometimes lack focus and fail to produce high quality ideas (Bao et al., 2010b). The problem definition implies the formalisation of several context elements in the creative workshop, notably related to the subject and the problem to be solved. The creative workshop is itself set into a context involving constraints, expectations and goals. All this information about the organisation required by the creative workshop will provide the data needed to define the evaluation method. Outlining a problem is a topic that is beyond the scope of this paper but further details are comprehensively dealt with elsewhere (Basadur et al., 1982; Getzels, 1975).

3.1.2 Definition of the set of criteria and scales

As mentioned in section 2, the criteria can depend on the context and the creativity definition: novelty-based or multi-attribute-based (Dean et al. 2006). The multi-attribute-based definitions of creativity claim that products must be novel and boast other high quality attributes (Kudrowitz and Wallace, 2013). To make a concrete contribution in a market or organisation, the idea should be applicable, useful and feasible—as well as novel—(Acar and Runco, 2012), all of which are evaluation criteria. For these reasons, the decision-maker will select the criteria from a list of suggestions or define his or her own criteria. However, a large number of criteria is not suitable in the evaluation of a large number of ideas (Riedl et al., 2010). Pragmatism also implies thinking about evaluators and so defining a scale: binary rating that leads to a ranking after an aggregation of the community votes, rating on a unique dimension and rating on various idea traits (Riedl et al., 2010). Of note is that fact that using overly simple scales leads to near-random results (Riedl et al., 2010).

3.1.3 Elicitation of the degree of importance for each criterion

Once a set of criteria is defined, they do not always have the same level of relevance from the decision-maker's viewpoint. It means that each criterion has to be weighted or at least prioritised according to the assumptions of the decision-maker. There are two solutions, either the decision-maker is able to expressly define the weight (direct weight elicitation) or the decisional pattern is elicited from a panel of ideas thanks to the preliminary application of MCDA methods (indirect

weight elicitation). The direct elicitation is the attributing of weight between 0 to 100% where the sum of the weight of each criterion is 100%. With regards to indirect weight elicitation, there are various methods for eliciting a decisional pattern. For example, the pairwise comparison of the criteria by the decision-maker as in the Analytical Hierarchical Process (AHP) (Saaty, 2008), establishing a description of the decision-maker's degree of satisfaction and then the quantification of the MACBETH performance expressions (Bana E Costa and Vansnick, 1997), or according to the ranking of a representative sample of ideas by parametric identification (Renaud et al., 2008). The choice of one of these mechanisms for defining the weight criteria depends on the available time and the nature of the decision-maker's information. The application of both methods (i.e. multi-criteria definition of the weight and the explicit elicitation of the weight) will be suitable for providing an indication about the coherence of the decision-maker and his or her strategy regarding the creative process.

3.1.4 Assignment to evaluators

There are different options regarding the evaluators depending on their number and their knowledge. Based on their number, there are two cases: unique evaluator or multiple evaluators. The former case considers only one evaluator, who evaluates the criteria previously defined. The latter case introduces the problem of the evaluator's diversity of knowledge. This latter case can also be induced by a lack of knowledge on the part of the decision-maker. This case is the evaluation of criteria by multiple evaluators. It can be processed in three different ways: everybody independently evaluates the same criteria, evaluators evaluate criteria adapted to their knowledge base, and evaluators evaluate criteria by consensus.

3.2 Idea evaluation

To better understand how the idea evaluation steps are processed, the three scenarios (e.g. a unique individual evaluation, the aggregation of individuals' evaluations or consensus of the group) will be described in further detail.

- The simplest scenario is the unique evaluator scenario, which can involve the decision-maker or an expert. The evaluation according to this scenario may occur once all the ideas are generated or throughout the ideation. In the case of a productive workshop, it can entail the evaluation of a large amount of ideas, which is time consuming. Moreover, despite formalised criteria, an evaluation based on a unique point of view can be a limitation. A solution to the time consuming nature of this element could be a pre-selection of the idea by the evaluators.
- The aggregation of evaluations can occur in different ways according to the role and the qualification of the evaluators. To respond simply to the time consuming issue of the unique evaluator, the participants are able to participate in the evaluation through a dedicated activity during the ideation phase. According to their qualification, they could classify ideas in a cluster (mapping the ideas), or evaluate the ideas according to specific criteria dedicated to them. This collective evaluation approach permits the decision-maker to prioritise the ideas that are evaluated. Another way is to define several evaluators who would individually evaluate the same criteria or criteria adapted to their qualification. In this case, the evaluators' points of view are multiple, which means the evaluation is more representative but there is still the issue of the quantity of ideas requiring evaluation.

- The consensus scenario is the collective fulfilling of the criteria. The evaluators have to discuss the ideas to evaluate the criteria. This approach can be a source of improvement for the idea but it will be more time consuming and it implies a social bias. This scenario can only be applied on a limited number of ideas.

3.3 MCDA processing

Once the ideas are evaluated, the data generated by their evaluation is processed through MCDA. This calculation step involves the sorting, ranking or clustering of ideas according to the MCDA methods applied. If digital tools are used, this step is exclusively computational and hence virtually invisible in terms of time. The MCDA methods applied depend on the number of evaluators (e.g. single or several evaluations per idea), the weight of the criteria, the nature of the result and the decisional pattern (e.g. preference function) from the decision-maker. For example, if the evaluation is the aggregation of individuals' evaluations, a group analytic hierarchy process could be applied, or if the decision maker is able to give function preferences to each criteria, the Multi-Attribute Utility Theory can be applied (Ishizaka and Nemery, 2013). According to the information collected during the *context definition* and the *idea evaluation*, the MCDA method adapted to this evaluation situation will suggest a result that is as close as possible to the expectations of the decision-maker. The choice of a single MCDA method for a particular situation is an interesting topic still under discussion in the MCDA community. Proposals and discussions have been discussed in the past by Adel Guitouni and Jean-Marc Martel (Guitouni and Martel, 1998) and more recently by Bernard Roy and Roman Słowiński (Roy and Słowiński, 2013).

3.4 Results and discussion

The results provided by the MCDA methods are from logic and calculus, they remain consultative. This means that the definitive decision about the choice of ideas to be developed and action to implement relate to the decision-maker. The results constitute a basis for discussion between decision-maker, expert and others protagonists from the next stage (i.e. implementation phase). It enables the informal decision made by the decision-maker to be tackled and questioned and hence reaches a balance between rational method and natural decision.

3.5 Detailed application approach

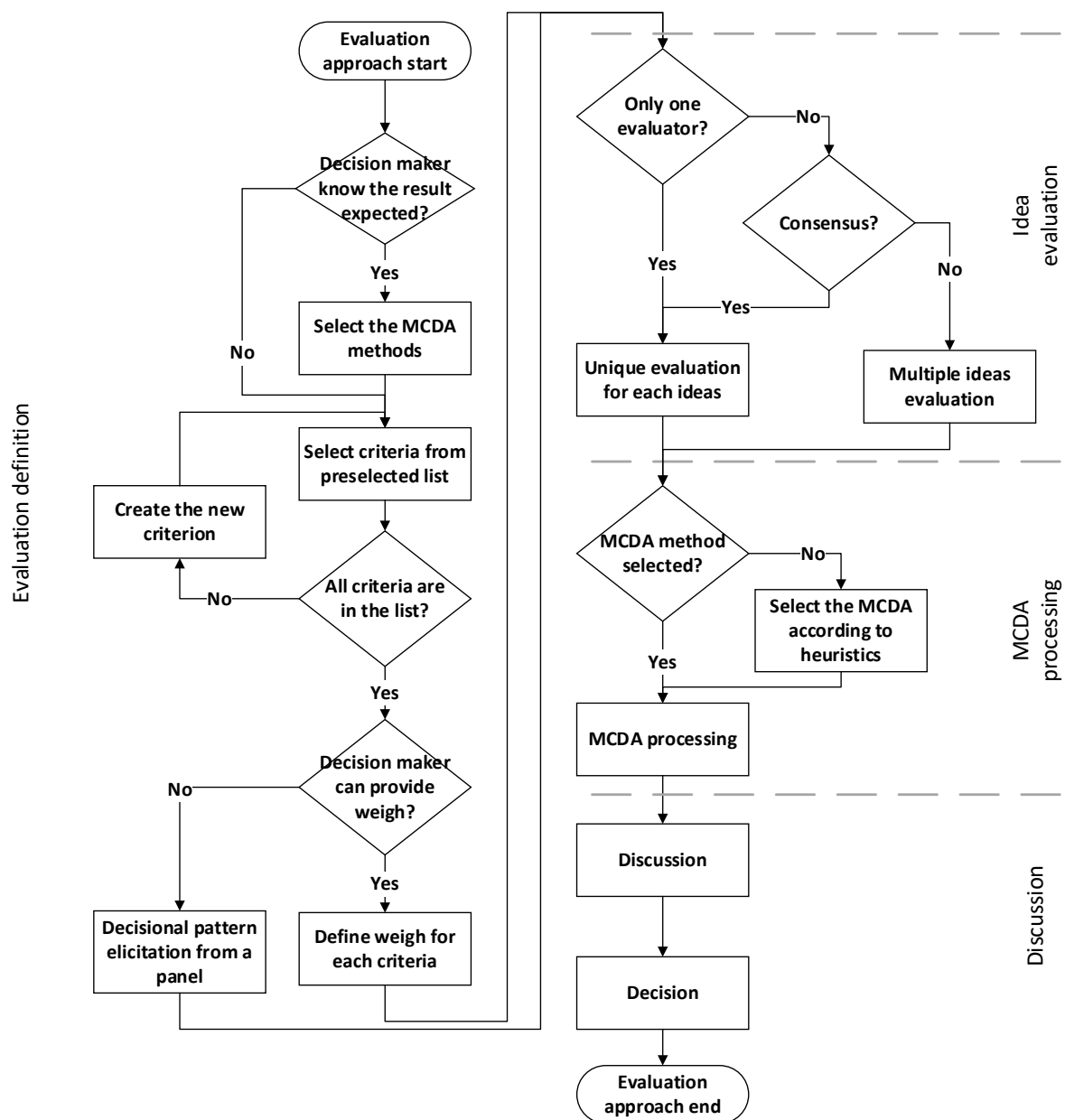


Figure 3. Detailed flowchart of the evaluation approach

To summarise, the proposed evaluation approach can provide a detailed depiction using a flowchart (Figure 3). As there are various MCDA methods, this flowchart was designed to be independent of the method applied, even if methods need more or less input information and effort (Ishizaka and Nemery, 2013).

4. Case study of the creative workshop for sustainable tourism in the city of Leticia

4.1. Context Definition

The Amazonian region in South America remains one of the most preserved areas in the world. However, thanks to the environmental and cultural diversity, a few years ago the region became an attractive tourist destination. During the first decade of the 21st century, the number of tourists has increased significantly in the largest cities of the region such as Leticia (+500%), Iquitos (+200%) and Gabriel, A., Camargo, M., Monticolo, D., Boly, V., Bourgault, M., 2016. Improving the idea selection process in creative workshops through contextualisation. *Journal of Cleaner Production* 135, 1503–1513. doi:10.1016/j.jclepro.2016.05.039

Manaos (+300%) (Obando Lugo et al., 2010). Despite the economic growth that this amount of tourists could bring to the region, there is growing concern for sustainability regarding this development, along with the environmental impact, the marginal inclusion of the local indigenous populations to this development and the cultural impact due to their contact with tourists (Craven, 2015; Ochoa, 2008). The city of Leticia and its most significant stakeholders (University, local authorities and tourism agents) are seeking to explore creative solutions to support the development of eco-tourism so as to find the best compromise between local development and the respect of the local environment and the traditions of the population. As part of the strategy, two creative workshop sessions were organised in coordination with the university in July 2014: the first with a group of 35 students in Bogota and the second with a group of 25 participants (including stakeholder members and students) in Leticia. Each session started with a half-day meeting. Initially, a short introduction was carried out to highlight the objectives and the scope of the study. There was also a short teambuilding game to foster a creative atmosphere. Next, two key divergent-convergent creativity phases were carried out, in line with classical creativity dynamics. As a parallel activity, the proposed methodology was deployed before (activity 4.1) during and after (activities 4.2 to 4.3) the workshop.

4.1.1. Problem assessment

The main topic of the workshop was *“exploring new products and services to promote ecological tourism in the Amazonian region from a sustainable viewpoint”*. Each group generated ideas; selected one idea from those created and presented it to a panel during a short presentation. The panel was composed of five professors/researchers and the city’s stakeholders. They individually evaluated each criterion for every idea presented.

4.1.2. Definition of the set of criteria and scales

According to the method presented, the first step was the evaluation definition. No specific expectations were expressed in terms of the evaluation of results by the stakeholders so the definition phase started with the definition of the criteria. Six criteria were defined for this subject: (i) originality of the idea, (ii) added value, (iii) Difficulty of implementation, (iv) risks incurred by the idea, (v) sustainability, and (vi) the quality of the presentation. A pre-established numeric scale from 0 to 5 was used for each criterion.

Originality: seeks to evaluate how novel, rare and uncommon a particular idea is, regarding the overall population (Dean et al., 2006a). Applied here, on the specific context of the Amazon’s sustainable tourism.

Sustainability: refers to how the idea will be implemented as well as minimising the impact on environment, indigenous culture and the respect of local living standards.

Added value: whether the idea will create wellbeing among the local population and the region in general, not necessarily in terms of monetary units.

Difficulty of implementation: assesses the level of complexity of the idea to be implemented with the local resources if it does not infringe known constraints, rules or norms.

Risks: seeks to gauge the consideration of factors of uncertainty in project implementation and the acceptability of the product or services derived from the ideas.

Presentation quality: refers to the thoroughness of an idea with regards to whether it is worked out in detail.

4.1.3. Elicitation of the degree of importance for each criterion

With regards to the weight of the criteria, the preferences of the stakeholders were not sufficiently well defined and it was not possible to define a panel of ideas to determine the decisional pattern, so each criterion was considered to be of equal importance (16.67%). As such, two additional scenarios were added. An initial scenario considering *Originality*, and a second considered the criteria of *Difficulty of implementation*. These additional scenarios represent different strategic orientations in order to highlight the impact of the weights on the final ranking of ideas.

4.2. Idea Evaluation

The engineering students from diverse disciplines and various participants were divided into five groups. They managed to produce a total of 88 ideas at the end of these two days of work. From these ideas, each group selected one idea to present to the five judges who evaluated the ideas individually according to the 6 criteria defined above. With regards to the evaluation as described above, the evaluators were professors/researchers and city policymakers.

Table 2. Details of the panel evaluation

Criteria		Originality	Added Value	Difficulty of implementation	Risks	Sustainability	Presentation
Weights 1 (%)		16,67	16,67	16,67	16,67	16,67	16,67
Weights 2 (%)		50,00	10,00	10,00	10,00	10,00	10,00
Weights 3 (%)		10,00	10,00	50,00	10,00	10,00	10,00
Idea name	(G1) Air amazon	3.3	3.1	2.9	3.3	3.1	4.1
	(G2) Expedition Kia	4.1	4.1	3.4	3.7	3.7	4.9
	(G3) Amazonian visitor center	4.3	3.9	3.3	3.6	3.6	4.1
	(G4) Cupid on Amazonia	4.1	3.4	2.9	2.7	3.1	4.0
	(G5) No-cash	4.7	3.4	3.9	3.3	2.9	3.7

In order to illustrate the dynamic character of the method, three different scenarios were evaluated with a first citing the weight of the whole criteria as being the same (16.67%). A second, focused on originality (weight originality =50%) and a third one focused on the difficulty of implementation (weight difficulty =50%). Table 2 summarises the judges' evaluation and assigned weights for each scenario. A quick description of the five ideas is available in appendix 1 in order provide a better understanding of their essence.

4.3. MCDA Processing

The criteria were considered as non-correlated with the set of weights defined above. The methodology adopted for the purpose of this case study is based on the method of outranking called PROMETHEE (Brans and Vincke, 1985). PROMETHEE (Preference Ranking Organisation METHod for Enrichment Evaluations). It was selected because it is a quite simple ranking method in its design and application compared with other methods for multi-criteria analysis. It is well adapted to problems where a finite number of alternatives are to be ranked considering several, sometimes conflicting criteria (Albadvi et al., 2007). Moreover, the decision-maker enriches the analysis through a visualisation technique incorporating the GAIA plane (Brans and Mareschal, 1994). On the basis of the well-known data analysis technique PCA (Principal Components Analysis), GAIA plane's objective is to describe the primary features of the decision issues graphically. This identifies similarities and differences in the actions undertaken, the existence of clusters of similar actions and conflicting criteria.

PROMETHEE is an outranking method, (pairwise comparison of the alternatives) based on the concept of *preference degrees* that allows ranking of the alternatives. As in the majority of the multi-criteria decision aid methods, $A = \{a_1, \dots, a_m\}$ of m alternatives which must be ordered, and a whole $F = \{f_1, \dots, f_n\}$ of n criteria which must be optimised. The resulting multi-criterion decision issue can then be expressed in the form of a decision matrix ($m \times n$) whose elements indicate the evaluation or the value of the alternative a_i according to the criterion f_j . Thus, the PROMETHEE method will be summarised as:

1. Computation of preference degrees for every pair of actions of criterion

Alternatives are compared in pairs for each criterion. The preference is expressed via a number in the interval $[0, 1]$; (0 for no preference or indifference to, 1 for strict preference). The function relating to the difference in performance or preference is called the generalised criterion and it is determined by the decision-maker. Where, f_j is a generalised preference function $P_j(d)$ with $d = f_j(a_i) - f_j(a_k)$.

2. Define a weighting vector, which is a measurement of the relative importance of each criterion, $W = \{w_1, \dots, w_n\}$
3. Outline the preference relation π for all the alternatives $a_i, a_k \in A$:

$$\pi : \left\{ \begin{array}{l} A \times A \rightarrow [0,1] \\ \pi(a_i, a_k) = \sum_{j=1}^n w_j P_j(f_j(a_i) - f_j(a_k)) \end{array} \right\} \quad (1)$$

The preference index $\pi(a_i, a_k)$ is a measurement of the intensity of the decision-maker's total preference for an alternative a_i compared to an alternative a_k and takes into account all the criteria simultaneously.

4. Computation of uni-criterion flows: Let us therefore consider the valued outranking graph and outline the outgoing flow for each node a defined by:

$$\phi^+(a_i) = \frac{1}{n} \sum_{k=1, k \neq i}^n \pi(a_i, a_k) \quad (2)$$

and the incoming flow:

$$\phi^-(a_i) = \frac{1}{n} \sum_{k=1 \neq K}^n \pi(a_k, a_i) \quad (3)$$

5. computation of global flows

$$\phi(a_i) = \phi^+(a_i) - \phi^-(a_i) \quad (4)$$

This requires the definition of a preference function, but in this case the preference would be to use the alternative with the highest score, however small the difference might be between the alternatives. The generation of this ranking has been calculated according to this sequence: once each judge has evaluated the ideas proposed by each group of participants, the mean is calculated to generate net flows. Next, the ranking is generated by computation of the aggregated scores based on the set of proposed preferences and weights to produce the global flows.

4.4. Results and Discussion

Table 3 Net flows and Rankings for each scenario

	W1		W2		W3	
	Net f	Ranking	Net f	Ranking	Net f	Ranking
G1	-0.383	5.0	-0.59	5.0	-0.42	5.0
G2	0.445	1.0	0.2675	2.0	0.3275	1.0
G3	0.225	2.0	0.235	3.0	0.145	3.0
G4	-0.316	4.0	-0.19	4.0	-0.38	4.0
G5	0.029	3.0	0.2775	1.0	0.3275	1.0

Table 3 summarises the results in terms of net flows (equation 4) and ranking for each idea under each established scenario. As shown in table 3, each strategic orientation leads to a different ranking of ideas. In scenario 1, the idea from group 2 (G2) is ranked best. In scenario 2 where Originality is preferred, the idea from group 5 (G5) is ranked best. To conclude, in scenario 3 where the difficulty of implementation is a discriminative criterion, there is a situation of incomparability, where ideas G5 and G2 amass the same net flow.

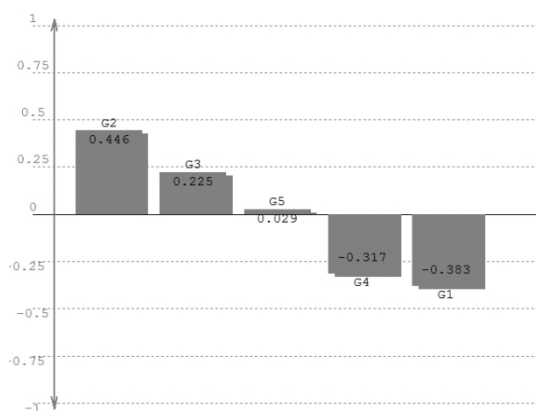


Figure 4. Ranking of the five ideas, scenario 1

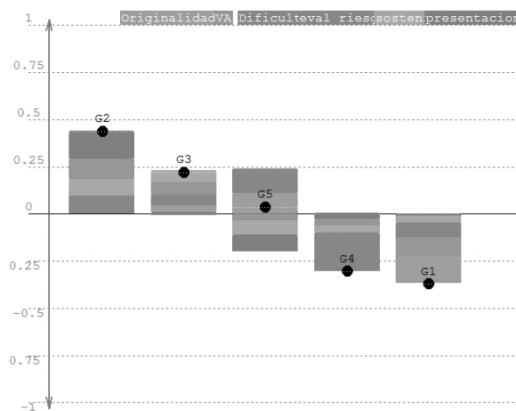


Figure 5. Ranking of the five ideas with detail of the contribution of each criterion, scenario 1

Figure 4, shows the ranking of ideas for scenario 1, using the software Smartpicker®, which is a PROMETHEE-based tool that ranks alternatives based on preference degrees (Ishizaka and Nemery,

2013). Figure 4 illustrates the relative ideas ranking compared to the net flow score of each idea proposed by every group of students, whereas Figure 5 provides an insight into the details of the contribution of each criterion in relation to the general score for an idea for the same scenario 1. So in the example, the idea proposed by group 2 (G2) has the best net score thanks to the contribution.

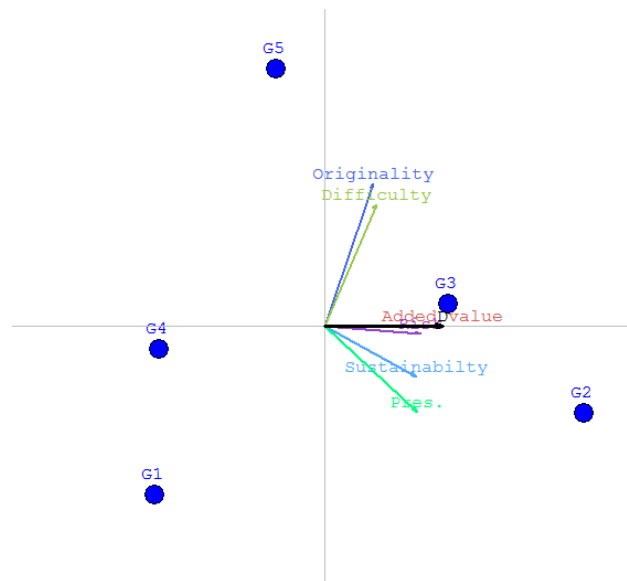


Figure 6 GAIA plane for the set of ideas and criteria

Figure 6 shows the GAIA plane in scenario 1. Here, the figure shows that idea G2 is also addressed at the three criteria, Added Value, Sustainability and Presentation, which explains its first place within the ranking. At the same time G1 and G4 are oriented in the opposite direction to the criteria.

5. Discussion

The proposed approach appears to be relevant for ranking a set of generated ideas during a creative workshop. However from the authors' viewpoint, its application allows decision-makers to have a better understanding of the decision-making process, clarify goals, preferences and create a unified vision of what a potential innovation process could be.

A balance between the time consuming nature of the evaluation activities and the results should be found when initiating the evaluation. Following the set of steps described in the paper may seem complicated to certain practitioners, but having a rigorous organisation process could ensure the enhanced value of the results obtained for an activity that mobilises a non-negligible amount of resources for a company and organisation. When realised internally within the organisation, creative workshops are motivating exercises geared at rallying people together around a project, but if results are not validated effectively, they will create a sense of frustration among participants that might later prove counterproductive.

A two-day workshop is a limited time to select the most relevant ideas so the final ranking could be criticised. However when dealing with huge amounts of idea sheets, the proposed process and the MCDA approach enable the formalisation of decision-maker preferences. As such, these preferences could be further utilised to deal with a whole set of workshop outcomes.

A collective nature has lead firms to address the crowd, defined as “A set of strangers assembled to perform a task” (Howe, 2008). This strategy has proven to be efficient in solving many problems and has attracted attention from both the academy and industry. With regards to the relevance of the ideas generated there is an interesting debate where some attach huge potential to crowdsourcing, while others remain sceptical. In his study of the contribution of ordinary users, Peter Magnusson has focused on the ideation of technology-based services (Magnusson, 2009), the author studies the contribution of ordinary users in the ideation of technology-based services. He concludes that, even if the technical relevance of ordinary users is lower than that of professionals, for these types of products, the ideation process at least allows companies to learn about users’ needs. Furthermore, other experience (Poetz and Schreier, 2012), compares ideas from ordinary users and the offers the firm’s professionals competitive examinations. Ideas were evaluated by executives of the firm (viewed blind). Results showed that, on average, ideas from users obtained higher scores in terms of novelty and customer benefits. To conclude, Lee Fleming discuss in his work that ideas generated by multidisciplinary teams are of lower quality on average, but a true breakthrough is more likely to come from such teams, which bears out the fact that different viewpoints can be a source of innovation as well (Fleming, 2004). Once again in this paper, we are focused on the tasks performed by these teams and the end output of the collective activities represented in a creative workshop.

Although any quantitative indicators have been set to measure the improvement observed through application of MCDA for evaluating ideas, the qualitative feedback from stakeholders during the various creative workshops are positive. This does not replace discussions by experts and the consensus of the protagonists in defining which idea to develop, but it provides additional material for guiding talks and explaining decisions. This approach of providing a framework for evaluating ideas is a way to reduce differences between far-sighted decision-makers and other protagonists.

Successful decision-makers link ideas to a sound knowledge of the context and apply informal criteria to this base. Formalising idea evaluation as presented in this article permits the formalisation of the context, the associated knowledge and the criteria. The creation of the theoretical background would permit an easing of the implementation of MCDA methods during creative workshops. The MCDA processing stage for the methodology could be carried out by the organiser themselves when the results generated by the workshop are discussed. The proposed flowchart constitutes a basis with which to create support for practitioners who attempt to implement a creative workshop.

6. Conclusion and Perspectives

Workshops are increasingly used in organisations to explore creative solutions and search for solutions leading to new products and services. This paper states that ideas resulting from creativity workshops must be carefully evaluated to enable decision-makers to validate and give concrete expression to the results. In this way, three key contributions are put forward:

- Firstly, the notion of contextualisation of this selection process through the selection of proper criteria adapted to the problem needing to be solved, but also to the particular context of the organisation. This is the context in terms of technology and organisational capabilities, as well as in terms of pre-established strategy.
- Secondly, a structured MCDA-based methodology is proposed to ensure a consistent evaluation process before, during and after the creativity workshop.

- To conclude, the proposed methodology is illustrated through a case study on the new eco-tourism services in the city of Leticia in the Amazonian region of Colombia with a view to sustainable development.

Two perspectives may be considered for future work:

A more in-depth study of the preference function among the different stakeholders must be explored to take into account particular needs. As a consequence the aggregation method must be revised to integrate group decision-making techniques.

This paper focuses on the idea evaluation process, but in order to contribute to the effectiveness of the creativity process, such an element should be integrated in these kinds of systems. This area is under constant development, but there is still a lot of work to be done.

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Appendix 1. General description of the selected ideas

Group number	Idea title	Short description
1	Air amazon	High added value tourism. The concept is to offer to public the experience of flying over the Amazonia with a null carbon footprint aircraft such as the Solar impulse aircraft. This concept Inspired from the 0 gravity experience possible by plane.
2	Expedition Kia	Promote the area of Amazonia thought game/survival expedition where participant can learn the culture and experience the lifestyle of indigenous populations, and win a prize for those who succeed physical, cultural and environmental challenge.
3	Amazonian visitor center	It concerns dedicated facilities near to the actual airport to ask tourist to follow a short training concerning the local environment and practices to do respectful tourism in Amazonia. This will be a condition the access of some restricted areas in order to insure sustainable touristic practices.
4	Cupid on Amazonia	A resort place for outdoor and nature lovers who want to date environment-friendly partner or couples who want to do their honeymoon in exotic places with a reduced ecological impact.
5	No-cash	A tourism based on exchange and sharing between the host community and the tourist. The intent is to avoid the use of money that tends to negatively impact the indigenous community culture.