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Classifying and comparing community innovation in Idea Management Systems

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ABSTRACT

The Idea Management Systems are a tool for collecting ideas for innovation from large communities. One of the problems of those systems is the difficulty to accurately depict the distinctive features of ideas in a rapid manner and use them for judgement of proposed innovations. Our research aims to solve this problem by introducing annotation of ideas with a domain independent taxonomy that describes various characteristics of ideas. The findings of our study show that such annotations can be successfully transformed into new metrics that allow the comparison of ideas with similar successfulness as the metrics already used in Idea Management Systems but in greater detail. The presented results are based on experiments with over 50,000 ideas gathered from case studies of four different organisations: Dell, Starbucks, Cisco and Canonical.
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1. Introduction

In the era of globalization the markets become more competitive and the organisations seek new ways of innovating. Among those attempts, are Idea Management Systems that employ Information Technology and crowd-sourcing principals to support innovation processes in the organisations. In particular, the notion behind those systems originates from simple suggestion boxes but is transformed into a more sophisticated process [48]. During the last decade of their evolution IdeaManagement Systems have extended their coverage from collecting ideas from large communities via computer networks to collaborative improvement of those ideas, the assessment of ideas and idea management in synergy with other enterprise processes [53].

Currently, Idea Management Systems are considered a very promising branch of computer software market [23] and various analyses of the vendor landscape [42,13] show rapid adoption growth in many enterprises in recent years. Nevertheless, the current state of the art Idea Management Systems still face key problems related to the large amount of human effort needed during the idea management process. Based on the testimonials of Idea Management Systems vendors [8] and case studies of various companies [30,9], the main origins of those problems are: large volume of submitted ideas, sudden peaks of submissions, redundancy of ideas, and large quantities of trivial ideas.

In our research we relate the above issues to the idea assessment phase and focus on challenges that arise when trying to quantify the value of information contained in ideas and its impact on innovation in the enterprise. According to the study of contemporary solutions by Hrastinski et al. [27], the problems of idea assessment are approached by: 1) the use of a handful of automatically generated yet very simple community statistics; and 2) expert reviews that require a considerable amount of knowledge and impose serious time constraints thus increase the costs of the entire idea management process.

In this article we present a solution for idea assessment that combines the advantages of those two cases mentioned by Hrastinski: rapid generation of metrics that require little expert knowledge yet offer more diversity and versatility than the current community metrics. In particular, we deliver a methodology for obtaining the metrics via analysis of idea annotations made with a domain independent taxonomy that expresses idea characteristics. The focus of the following article is to show that the proposed set of metrics can be applied to Idea Management Systems in a meaningful way that would allow to capture the distinctive features of ideas and to compare entire idea datasets.

The article is structured as follows: firstly we summarise the past research achievements in terms of metric generation for Idea Management Systems as well as other kinds of computer-supported cooperative work systems (see Section 2). Additionally, in the same section, we discuss research on capturing the meaning of innovation in general and show how it influenced our work. Afterwards, we introduce our contribution in a form of a taxonomy for describing idea characteristics and present in more detail the theoretical grounding by referring to

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particular innovation models (see Section 3). Finally, we show how to utilise the proposed taxonomy in practice of Idea Management Systems by transforming the idea annotations into metrics that characterise the entire systems (see Section 4). At the end, we present the results of our experiments that test the usage of the taxonomy for annotation (see Section 5.1) as well as verify the performance of metrics generated from those annotations in relation to the contemporary parameters of Idea Management Systems (see Section 5.2).

2. Related work

Having a significant presence in the industry, Idea Management Systems have also been investigated by the academia in search of problems and patterns that emerge when using this class of systems in an organization (e.g. [6]). In our case, the investigative work on idea assessment is of special interest. Within this area, Hrastinski et al. [27] surveyed a number of selected products and pointed out that the current commercial systems employ rather simple idea evaluation methods most often being analysis of community statistics (number of ideas per user, community voting results, number of idea comments etc.) or internal business metrics that are delivered by designated experts (e.g. return of investment, and market value). Both of those approaches have been evaluated by Gangi et al. [24] and compared to conclude that in practice none of the current methods have a significant impact on which ideas are being implemented by the organisations. Following those conclusions, there have been various approaches that attempted to find a solution to time efficient and effective automatic idea assessment problem e.g. with prediction markets [11], by applying problem solving algorithms [3], calculating metrics for the quality of management [16] or using data from other enterprise systems to automatically assess ideas [38,52]. All those solutions are based on the notion of reusing existing data whereas the approach proposed by us claims that there is a necessity to attach some additional data to ideas in order to improve assessment and selection phases of the idea life cycle.

Apart from the Idea Management Systems domain research, there has been a huge number of works that attempt to analyse characteristics of discussions or content created by communities in a collaborative way e.g. [46,5,39]. Among those, Perey [40] describes a necessity to go beyond simple metrics that count number of interactions with the system in time. However, in contrast to us, in his work Perey focused only on measuring characteristic features of users and their interactions with each other rather than metrics on content that those users create. Klein [33] notices similar problems with regard to difficulties in assessment and browsing community submissions but he attempts to find a remedy through experimenting with novel system interaction methods, in particular argumentation tools [32]. While this approach is different to ours it shows an interesting alternative not only for generation of new metrics but altering the entire philosophy of Idea Management System front-end which in turn can create new opportunities in the back-end.

Outside of the aforementioned areas of computer science, there has been a large number of works that investigate ways of categorising innovation and attempt to quantify it. While preparing for the creation of the taxonomy and validating it afterwards we analysed those models as a reference. We started from the very origins of Schumpeter's innovation theories [44] and finished with the contemporary work on the topic. The selection of models that we have analysed as related was based on studies from a number of works that attempt to revise the state of the art on innovation models [21,41,17,14,25]. During our work, we prepared a taxonomy model that included the various perceptions of innovation from those models. The preliminary experiments with this taxonomy version have shown that most reviewers did not know how to apply the terms. Consequently we made a choice to propose the taxonomy, as described in the next section, only based on the analysis of idea content from Idea Management instances that we gathered.

3. A domain independent taxonomy for idea annotation

In this Section, we introduce a taxonomy that captures the characteristics of ideas published in an Idea Management System. In our methodology, the taxonomy is used to annotate ideas with terms that later serve as a base for calculating metrics. The choice of terms that establish the taxonomy is based on our experience with different kinds of Idea Management datasets gathered during the course of Gi2MO project [54]. This initiative aimed to enrich contemporary Idea Management Systems with an extensive use of metadata according to the Semantic Web principles. During the project we gathered various datasets ranging from ideas for technology to products for mass consumer (see Section 5.2 for detailed dataset description). Based on the analysis of those datasets, we enumerated the key characteristics of ideas that could be inferred from the idea text and organised them into a hierarchy. The taxonomy model that we propose can be summarised by the following hypothesis:

> "Every idea that was *proposed* has been *triggered* by a particular experience and describes a certain *innovation* put in context of application in a given *object*."

"Proposed", "triggered", "innovation" and "object" represent the four main characteristics of an idea that we established as the root for further taxonomy terms which detail a particular aspect of the idea characteristics (see Fig. 1).

The *trigger* branch details aspects related to experiences that influenced creation of the idea. While analysing the ideas gathered in different Idea Management Systems, we noticed that users often tend to mention how they came up with a particular innovation in order to justify their claims. Similarly, innovation models of Kelly and Kranzberg [31], Usher [50], Myers [36], Hughes [28] as well as contemporary research [37] notice the existence of various causes that lead to idea generation. In particular, innovation is described as being a result of recognition of a problem, need for changes or recognition of technical feasibility or demand. Those different types of triggering experiences are referred by us in the trigger branch as *Observation Types*. Additionally, Usher [50] has shown that innovation is not only triggered by experiences related to a personal observation but also events that influence the innovator and lead to an act of insight. We relate to this by characterising the type of event that led to the idea with *Creativity Origin* classification and by identifying the connection between the triggering experience and the object that is innovated (*Associated Object*).

The *innovation* branch relates the idea proposal to the reality of the enterprise and the state of the Idea Management facility. As such, the assessment made by annotators that use this taxonomy branch goes to the origins of the very understanding of innovation in enterprise discussed for tens of years since the original contributions by Schumpeter [44]. The verity of models proposed since then shows that interpretation of innovation can be extended in many different directions depending on the context and goals. In our work, we took into account the previous models (see Section 2), however we narrowed down the amount of terms based on experiences with idea datasets and inferences that could be made based on idea text. As a result, we noticed three key aspects that were mentioned by innovators and reviewers in the Idea Management Systems: relations to other ideas previously posted in the system or innovations introduced by the organisation (*Dependence*), descriptions of usefulness of the idea for a particular group (*Target Audience*), references to idea originality with respect to current state of organisation or entire market (*Originality*).

The *object* branch focuses on describing the entity that is being innovated and the changes proposed in relation to the original. Apart of the classical distinction between products and processes [1,51,4], we also recognize service innovation as it has been advocated by a

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