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Ontology focused crowdsourcing management

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Abstract

Companies should be aware of the market situation and have a connection to customers, possible customers, and other individuals around a company. Crowdsourcing is the act of going inside or outside of the company's normal organizational set-up to an undefined crowd, and it can be utilized in several ways to produce value for a company. Ontologies provide a better understanding of different concepts and can be utilized for managing a company's activities in a holistic way. This paper introduces ontology-focused crowdsourcing management. Crowdsourcing of a company is constructed via several concepts which are crucial for succeeding in crowdsourcing activities. Current crowdsourcing ontology studies are lacking in holistic crowdsourcing views. This paper fills the research gap, providing a holistic view of crowdsourcing and its management.

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1. Introduction

Crowdsourcing provides several opportunities for a company. Crowdsourcing as a phenomenon is complex, connecting several fields of management. Generally, crowdsourcing is the act of going inside or outside of the company's normal organizational set-up to an undefined crowd [1, 2, 3]. However, crowdsourcing requires an ontological understanding for generating new models for companies to develop their activities. The last decade of research on ontology alignment brought a wide variety of automatic methods and techniques to discover correspondences between ontologies [4]. Ontologies enable the understanding of real world concepts and provide possibilities for developing information technology (IT) systems focused on ontologies [5]. Crowdsourcing includes a human element which, therefore, is challenging for ontological modeling.

Crowdsourcing, as all other activities of a company, requires management. Kantola claims that all decisions should be based on real, holistic knowledge, instead of educated guesses, intuitive feeling, or limited information representing only some aspects of the objects managed [6]. Crowdsourcing activities should be managed for increasing profitability a result of crowdsourced activity. Ontologies provide the opportunity for understanding the crowdsourcing phenomenon and its priority for a company.

The current crowdsourcing literature discusses ontologies by concisely providing important intensive knowledge about crowdsourcing [4, 7, 8]. However, more knowledge is required for understanding crowdsourcing ontologies in a holistic context. This paper fills the research gap and presents an ontology-based approach for crowdsourcing management and aims for a more holistic understanding about crowdsourcing and its utilization as a company's activity.

This paper is organized as follows. The theoretical framework of the study is highlighted in section two. Section three discusses the methodological choices of the study. The fourth section sheds light on ontology-based crowdsourcing management, before the paper concludes.

2. Theoretical framework

This section sheds light on the relevant literature for the study. First, crowdsourcing literature is highlighted. The second section discusses ontologies and their importance. Finally, management of ontologies is highlighted in this section.

2.1. Crowdsourcing

Crowdsourcing provides, for instance knowledge about markets, for a company. However, crowdsourcing is still a relatively new concept for businesses and science. Howe introduced the concept of crowdsourcing in *Wired* magazine in 2006 and defined it “the act of taking a job traditionally performed by a designated agent (usually an employee) and outsourcing it to an undefined, generally large group of people in the form of an open call” [3, 9]. Howe's crowdsourcing definition can be kept as an original definition of crowdsourcing. Crowdsourcing can apply to both a company's internal or external activity, and the size of the crowd can vary based on the task type and scope [10, 11]. Crowdsourcing happens mostly online, but not exclusively so [12]. Online platforms can be used for task setting, but the actual crowdsourced work can be implemented offline. Therefore, crowdsourcing can occur offline as well as online.

Crowdsourcing can be utilized widely, but a company's innovation activities especially can employ crowdsourcing. Crowdsourcing can be utilized, for instance, for quality verification, collecting ideas, testing products and services, funding an innovation, finding customer clusters, and co-operations [10]. Thus, crowdsourcing can be employed not only in innovation activities, but in other activities as well. Crowdsourcing includes three main categories, which are knowledge, resource, and funding focused. Crowdsourcing types are, for instance, crowd wisdom, crowd creation, microtasking, macrotasking, and crowdfunding [13]. Nevertheless, all crowdsourcing types include utilization of an undefined crowd and might include tangible or intangible compensation. Tangible compensations can be, for example, pay or a product, and intangible compensations could be recognition or status [14]. Selection of compensation depends on the crowdsourced task type, scope, and demanded results of the crowdsourced activity. Compensation can influence the quality of the results of an crowdsourced task.

2.2. Ontologies

Ontologies concern the nature of reality and raise questions about human assumptions about the way the world operates and the commitment to particular views [15]. Moreover, an ontology is an explicit specification of a conceptualization which is an abstract, simplified view of the world that we wish to represent for some purpose [16]. Ontologies provide perceptions and understanding of terms, concepts, and their relationships, and can provide a lot of information or just a small amount information depending on the ontology and its concepts.

Ontologies can be highly informal if they are expressed in common language, semi-informal if expressed in common language in a restricted, structured, or formal manner, semi-formal if expressed in an artificial and formally defined language, and rigorously formal if they provide meticulously defined terms with formal semantics, theorems, and proofs of properties and completeness [17]. Ontologies provide a way to communicate with devices, the internet, and between people when concepts are understood. Modern technologies, for instance, the Internet of Things, require ontologies for exchanging the data between servers, machines, and people [18]. Therefore, it is necessary to understand how ontologies are connected to one another and which concepts a single ontology includes. This is especially important for a crowdsourcing ontology, which includes human and technological elements.

2.3. Management of ontologies

Kantola argues that ontologies could provide an approach to specify and manage management objects in a holistic way [19]. Managers can understand objects, which are part of a company, more holistically using ontologies. The ingenious management framework highlights the needs of ontologies and instances in management [6]. Figure 1 illustrates the ingenious management framework.

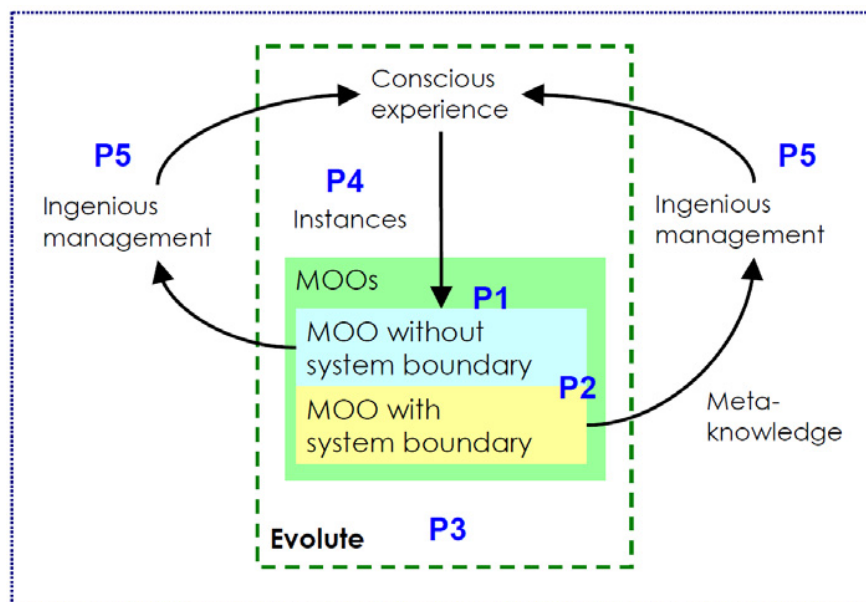


Fig. 1. The ingenious management framework [19].

Members of a company gain organizational resources in their sensible experience, as illustrated in Figure 1 [6]. Kantola specifies these organizational resources as ontologies (MOOs: Management Object Ontologies) [19]. A system boundary can exist in some ontologies but not others. Those which have a system boundary can produce metaknowledge [6]. Evolute technology can be utilized for evaluating ontologies linguistically [6]. The ingenious management framework provides an opportunity for understanding objects around a company, and managing them with a high degree of consciousness, because management objects are understood.

Crowdsourcing includes interaction between the crowd and a company. Generally, crowdsourcing activities include public or private online platforms which can be used for managing the crowd with ontologies. A crowdsourcing ontology provides understanding about crowdsourcing concepts; therefore, crowdsourcing activities can be managed more effectively and knowledge can be used more diversely between humans and machines.

3. Methodology

This study is based on empirical research conducted by Sivula and Kantola [10, 13, 20] and Sivula et al. [21]. Empirical data included 18 case companies which are acting in a wide range of industries. Case companies provided experiences and utilizations of crowdsourcing in innovation-related activities. Crowdsourcing has several definitions in the literature and in the terminology of case companies. Thus, the holistic crowdsourcing ontology is demanded for the filling of this gap. An ontological model is constructed from several concepts utilizing empirical evidence and the literature.

The ontology in this study is conceptualization of crowdsourcing. Concepts include sub-concepts that build actual concepts. One concept can have several sub-concepts. Moreover, ontology has multiple concepts which are constructed based on empirical evidence. This paper describes the holistic crowdsourcing ontology which can be utilized in several ways for developing the management of crowdsourcing and concepts related to it in a company. Crowdsourcing ontology can be utilized by machines and humans in knowledge creation and sharing. Therefore, crowdsourcing ontology can be utilized in several IT systems as well.

The internet-based Evolute system can be used for a model crowdsourcing ontology, which managers can utilize in management activities. The Evolute system provides visually presented results and knowledge of instance-based reasoning to justify decisions and actions regarding management objects [19]. Crowdsourcing ontology is a management object that can be, therefore, modeled for the Evolute system and utilized in management activities.

4. Ontology based approach for managing crowdsourcing

Crowdsourcing is a relatively new concept and involves several areas in management. Ontology in this paper is company-based and can be seen as a unit benefiting from crowdsourcing. Moreover, crowdsourcing generally requires an online platform, which is utilized for interacting with the crowd. Figure 2 illustrates crowdsourcing ontology.

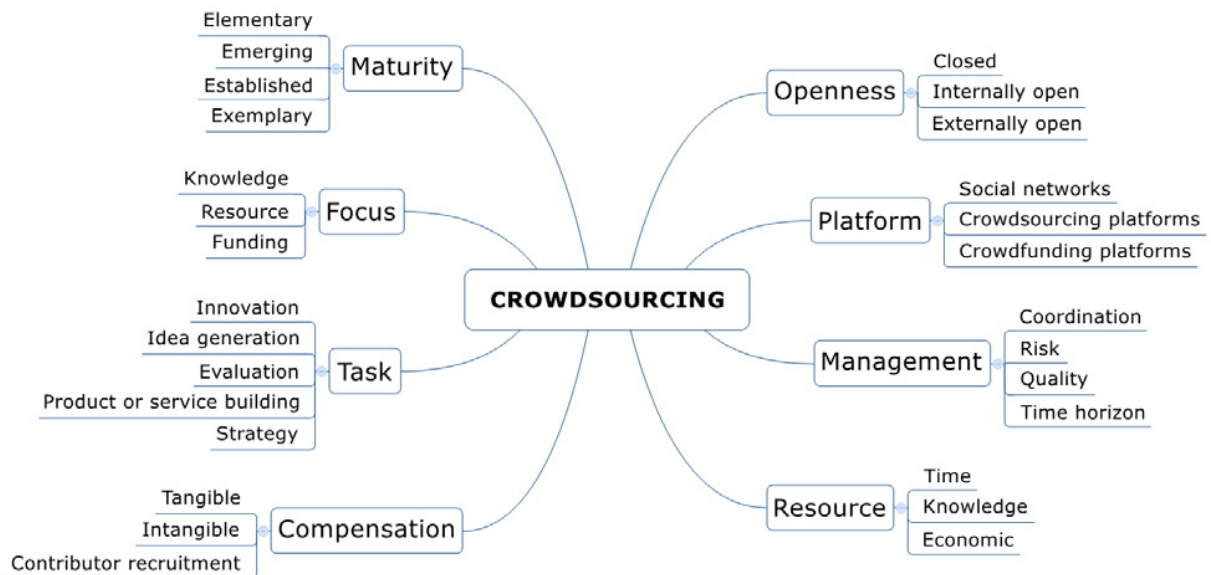


Fig. 2. Crowdsourcing ontology.

Multiple concepts relate to crowdsourcing as illustrated in Figure 2. A crowdsourcing ontology provides a holistic understanding for managing crowdsourcing operations. The following sub-sections describe concepts which are related to crowdsourcing ontology.

4.1. Openness

Crowdsourcing requires openness from a company. However, a company does not have to be entirely open to the crowd. Openness as a concept can be either closed, internally open, or externally open. If a company is closed and does not want to deliver any information to the crowd, then crowdsourcing activities can be challenging to execute because the crowd needs to have enough information to implement the required task. If crowdsourcing is implemented internally, then only the internal crowd of a company needs to have information. External openness is required when crowdsourcing activities occur outside of a company. However, a company can also define which knowledge it will deliver to the crowd. It does not have to contribute full knowledge about the task or entity which the crowdsourced task supports.

4.2. Platform

Crowdsourcing activities require an online platform which can be collaboration based. Crowdsourcing platforms provide an opportunity for a company to manage the crowdsourced tasks and can be owned by a company itself or a third party that provides crowdsourcing as a service. Moreover, crowdfunding platforms require features for transferring funds and marketing a product or service which will be developed. Commonly these operations are implemented by means of videos and attractive web sites. Social media platforms can be utilized in crowdsourcing activities, as well. Facebook or Twitter can be used, for instance, to evaluate and generate ideas of a company, and to test the market demand of a new product or service resulting from explored ideas.

4.3. Management

Crowdsourcing requires several types of management. Coordination of the crowd is essential to crowdsourcing activities. Coordination has an effect on results which a company receives from crowdsourced task. Crowdsourced tasks include risks which can be, for instance, failure of implementing a product or service, failure to recruit crowd contributors, or recruitment of a crowd representing only one customer group of a company. Risks need to be identified, and managed properly if they materialize. Moreover, the quality of the results should be managed in order to generate better results for a company. Crowdsourced task implementation can have a long or short time horizon, depending on the crowdsourced task type and complexity, which also need to be managed.

4.4. Resource

Crowdsourcing tasks require resources from a company. Planning, managing, and execution of crowdsourcing tasks demands time, which can be seen as one of the most important resources of a company. Knowledge about crowdsourcing and its models are required for succeeding in crowdsourcing activities. Economic support is required for crowdsourcing tasks for implementing crowdsourcing services or utilization of services provided by a third party. However, social networks and other widely used crowdsourcing platforms can be utilized as well. Resources have a direct connection to the success of the crowdsourced task, and therefore a company's management should always consider when it could utilize crowdsourcing in its activities.

4.5. Compensation

The compensation of a crowdsourcing activity can be tangible or intangible. The compensation type is connected to the task that the crowd implements. A company should consider tangible compensations if a task is extensive. If a crowdsourced task is not extensive then intangible compensations may be considered. However, small contributions from the crowd could lead to major profits for a company, which should therefore consider utilizing tangible compensations for motivating the crowd if the task achievement is important to the company. Moreover, a company should be aware of techniques that can be utilized for recruiting crowd contributors who, at the final stage,

implement the crowdsourced task. A company should analyze which compensations would match the specific crowdsourcing task for the purposes of motivating the crowd.

4.6. Task

A company can crowdsource several tasks, including parts of its strategy. Crowdsourcing can be utilized, for example, in the value creation process, the measurement of management performance, and provide knowledge about new markets. These tasks can be divided between internal and external crowdsourcing tasks. Crowdsourcing can be used for idea generation and as a model for implementing an innovation. Implementation of innovations can be carried out partly or entirely with crowdsourcing. Moreover, crowdsourcing can be used for evaluating a company's products, services, and processes. Therefore, utilization of crowdsourcing can be a wide-scale part of a company's activity.

4.7. Focus

Crowdsourcing has three main types, which are knowledge, resource, and funding focused. Knowledge-focused crowdsourcing achieves a task by utilizing the crowd's knowledge in creating value for a company. A task can be, for instance, simple feedback which is commonly utilized in internet stores in evaluating products and services. Resource-focused crowdsourcing tasks are more intensive and requires more time for task achievement from the crowd. The task can be, for instance, programming software or implementing a technology-based innovation entirely. InnoCentive is a service which was one of the first of this kind of crowdsourcing activity [22]. Moreover, crowdsourcing can be fund-focused, also known as crowdfunding. Fund-focused crowdsourcing is utilized for collecting micro or macro amounts of capital from the crowd in order to finance a company's activity. Kickstarter is one of the most commonly utilized fund-focused crowdsourcing platform for innovations [23].

4.8. Maturity level

The crowdsourcing maturity level of a company affects its crowdsourcing activities. Holistic crowdsourcing ontology follows a four-level maturity model implemented by Bartlett [24]. A company can be seen as elementary (Level 1) if it can use crowdsourcing to generate incremental improvements on focused topics, typically only affecting the internal crowd. A company is emerging (Level 2) when it can use crowdsourcing to generate ideas to incrementally improve specific tactics and strategies affecting the company's bottom line or customer interface. A company is established (Level 3) if it can use crowdsourcing to effect innovative change in areas that are crucial to the company's business model, by co-creating solutions with customers and business partners. A company is exemplary (Level 4) if it can use crowdsourcing to uncover industry-transforming paradigm shifts, engaging a broad cross-section of stakeholders, and even competitors. Companies are commonly beginning to utilize crowdsourcing at an elementary level, which is therefore an essential step for a company.

5. Conclusions

This paper discussed an ontology-based management approach for crowdsourcing and provided several perceptions on the topic. Crowdsourcing is still a relatively new concept for businesses and science, and therefore requires the development of a holistic ontology. Crowdsourcing can be a useful model for a company's activities and holistic ontology provides new way of managing crowdsourcing operations. Therefore, crowdsourcing requires management, which can be based on crowdsourcing management ontology. Crowdsourcing ontology provides eight concepts which managers can utilize for managing crowdsourcing activities. Ontology includes openness, platform, management, resource, compensation, task, focus, and maturity concepts. These concepts affect the final results and value which a company receives from crowdsourcing activities.

Crowdsourcing ontology can be utilized by managers in understanding the state of crowdsourcing in the company. The definition of crowdsourcing ontology provided in this paper should be empirically tested in the future. The Evolute system can be utilized for the modeling and testing of crowdsourcing ontology in fuzzy-logic-

based IT systems. Moreover, it is suggested that indicators are developed for crowdsourcing ontology which indicate a specific concept and sub-concept. It would create value for testing the crowdsourcing ontology with the Evolute system in several case companies. Nevertheless, companies can utilize crowdsourcing ontology for understanding the state of crowdsourcing in their current activities and develop their management processes based on the ontology.

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