CROWDSOURCING INFORMATION SYSTEMS – DEFINITION, TYPOLOGY, AND DESIGN

Research-in-Progress

David Geiger
Business School
University of Mannheim, Germany
geiger@uni-mannheim.de

Michael Rosemann
Science and Engineering Faculty
Queensland University of Technology
Brisbane, Queensland, Australia
m.rosemann@qut.edu.au

Erwin Fielt
Science and Engineering Faculty
Queensland University of Technology
Brisbane, Queensland, Australia
e.fielt@qut.edu.au

Martin Schader
Business School
University of Mannheim, Germany
martin.schader@uni-mannheim.de

Abstract

Crowdsourcing has become a popular approach for capitalizing on the potential of large and open crowds of people external to the organization. While crowdsourcing as a phenomenon is studied in a variety of fields, research mostly focuses on isolated aspects and little is known about the integrated design of crowdsourcing efforts. We introduce a socio-technical systems perspective on crowdsourcing, which provides a deeper understanding of the components and relationships in crowdsourcing systems. By considering the function of crowdsourcing systems within their organizational context, we develop a typology of four distinct system archetypes. We analyze the characteristics of each type and derive a number of design requirements for the respective system components. The paper lays a foundation for IS-based crowdsourcing research, channels related academic work, and helps guiding the study and design of crowdsourcing information systems.

Keywords: crowdsourcing, information systems, socio-technical systems, typology, taxonomy

Introduction

Crowdsourcing is an umbrella term for a variety of approaches that harness the potential of large crowds of people by issuing open calls for contribution to particular tasks. Although crowdsourcing approaches may take many different forms, it is nowadays increasingly performed via the Web (Davis 2011), which enables the interaction with a plurality of contributors all over the world. Some prominent examples include Web platforms for problem solving (e.g., InnoCentive), knowledge aggregation (Wikipedia, TripAdvisor), data processing (ReCaptcha), design (iStockphoto, Threadless), and further user-generated content (YouTube, App Store).

Employing information technology as a facilitator, crowdsourcing organizations are able to process a potentially vast number of various electronic contributions from the crowd. A crowdsourcing process comprises a number of activities that involve resources within and beyond organizational boundaries, mostly human participants and information technology. The characteristics of the activities and resources within this process depend on the specific purpose of a crowdsourcing effort.

Research on crowdsourcing comes from a variety of fields such as computer science, management, psychology, and many other areas that have discovered crowdsourcing as a useful approach. Accordingly, research questions mostly center on specific use cases and individual aspects of crowdsourcing (Geiger, Seedorf, et al. 2011). This fragmentation of crowdsourcing research and a general lack of foundational theory (Hevner et al. 2004), however, make it difficult to provide organizations with well-founded guidance for the design of their crowdsourcing initiatives. We believe the Information Systems discipline is better suited than any other research area to provide guidance here as its joint focus on the IT-user interaction provides an important understanding for the development of an integrated, holistic systems perspective of the involved components and their relationships.

Inspired by IS research and systems theory, we propose in this paper the first typology of socio-technical crowdsourcing systems. By this, we not only provide a deeper and comparative understanding of the different types of crowdsourcing solutions, but also help to channel related academic work. We then use this typology to complement the current research that is centered on the use of crowdsourcing solutions with a stronger focus on the design of such solutions. A (socio-technical) systems perspective on crowdsourcing will serve as a theoretical foundation for IS-based crowdsourcing research that can draw on a multitude of existing insights from systems-related fields.

Consequently, this paper will address the following research questions:

(i) What are the components and interrelationships of crowdsourcing information systems?

(ii) What are the archetypes of crowdsourcing information systems?

(iii) What are the implications of these archetypes for system design?

The next section develops a definition of crowdsourcing information systems based on a comprehensive literature review. By considering the organizational function of such crowdsourcing systems, we will advance the fundamental distinction of crowdsourcing information systems (Geiger, Rosemann, et al. 2011). In the context of this research-in-progress, we exemplarily analyze the implications of this distinction on some specific design aspects across the archetypal systems and thus demonstrate the usefulness of our theoretical framework. Finally, we summarize our efforts and provide an outlook on the next steps and potential applications of our work.

Crowdsourcing Information Systems

A *system* is a set of interrelated elements or components that work together to achieve an overall objective. Systems have a clearly defined boundary and exist as components or subsystems of other systems, their environment. Most systems are open, i.e., they interact with their environment via interfaces. Systems are ubiquitous and can, for instance, be of biological, technical, or social nature. (Ackoff 1971; Bertalanffy 1972; Churchman 1968)

Information systems (IS) are subsystems of an organizational system that provide an organization with information services needed for operations and management (Davis 2000; Falkenberg et al. 1998;

Heinrich et al. 2011; O'Brien 2004). Understandings of the term information system differ widely in the extent to which they emphasize social vs. technical concerns (Alter 2008; Carvalho 2000; Falkenberg et al. 1998). While some academics hold a primarily technical view (e.g., Ein-Dor and Segev 1993), the majority of the IS community view information systems as socio-technical systems that integrate human and machine components (Davis 2000; Heinrich et al. 2011; Kroenke 2011; Land 1985; O'Brien 2004; Valacich et al. 2011; WKWI 1994). Well-founded socio-technical approaches study information systems within their organizational context and thus ensure that the individual elements, e.g., the IT component, and their design are aligned with this context and with each other (Alter 2008; Carvalho 2000; Lyytinen and Newman 2008).

As one particular socio-technical approach, we will make use of the work system approach, which defines an information system as "a system in which human participants and/or machines perform work (processes and activities) using information, technology, and other resources to produce informational products and/or services for internal or external customers" (Alter 2008). Informational products are understood in a broad sense and include, for instance, the production of digital goods. The work that is performed in such a system, i.e., its processes and activities, is devoted to a generic function of processing information, which involves "capturing, transmitting, storing, retrieving, manipulating, and displaying information" (Alter 2008). As a means to describe and analyze an information system, the work system framework identifies, among others, the four basic components that are involved in performing the work: processes and activities, (human) participants, information, and technologies. The work system view on the function and elements of information systems can be mapped to the definitions in most of the IS textbook literature (Davis 2000; Ferstl and Sinz 2008; Gray 2006; Heinrich et al. 2011; Huber et al. 2006; Kroenke 2011; O'Brien 2004; Rainer and Cegielski 2010; Valacich et al. 2011).

Building on this definition, we introduce *crowdsourcing information systems* as a special case of information systems that produce informational products and/or services for internal or external customers by harnessing the potential of crowds. A crowd in this context refers to a group of people that is addressed via an open call for participation in a particular task. By responding to such a call, members of this crowd identify themselves as contributors and, thus, form an a priori unknown subset that becomes part of the system. In order to maximize the number of potential contributors, many systems aim to keep the targeted crowd as large as possible for a given task.

The essential work in crowdsourcing information systems is performed by the crowd. In other words, the processes and activities in such systems rely primarily on contributions from the crowd to transform existing information and/or produce new information. Information technology is used to enable and, where possible, support the activities. Other human participants, which are not recruited from the crowd, e.g., traditional employees, may be part of the system to manage the process. The specific characteristics of all system components and the relationships among them, however, vary across different systems. A classification of crowdsourcing information systems into distinct system archetypes will therefore allow us to conduct a closer examination.

A Typology of Crowdsourcing Information Systems

Although examples for crowdsourcing approaches can be found throughout the centuries (Surowiecki 2005), it is only recently that they have been considered related phenomena (Howe 2009). Ever since, researchers from different fields have analyzed crowdsourcing and its numerous manifestations in a variety of contexts. Consequently, the research landscape and potential knowledge about crowdsourcing systems and their components is predominantly fragmented. The development of typologies is an adequate means to approach this issue as they can provide structures to organize the body of knowledge and enable the study of relationships among otherwise disorderly concepts (Glass and Vessey 1995; Nickerson et al. 2012).

Existing classification systems in the crowdsourcing field, however, focus on specific use cases and individual aspects and thus fail to provide a comprehensive picture of the overall phenomenon (Geiger, Rosemann, et al. 2011). A fundamental differentiation of crowdsourcing approaches on a system level will allow us to develop an integrated and comparative understanding of the respective socio-technical designs. By enabling a more differentiated perspective, a typology of systems will also allow us to channel existing research results and attribute divergences to systematic differences (Sabherwal and King 1995).

Methodology

We apply a method for taxonomy development in IS developed by Nickerson et al. (2012). They propose a structured approach, which is based on methodological guidance from related fields and on a comprehensive literature survey of 73 papers that develop taxonomies in IS. We note that, according to Nickerson et al., the terms taxonomy and typology are often used interchangeably. One of the main traits of the method is the definition of a meta-characteristic as a first step to the development of any taxonomy:

> *"The meta-characteristic is the most comprehensive characteristic that will serve as the basis for the choice of characteristics in the taxonomy. Each characteristic should be a logical consequence of the meta-characteristic. The choice of the meta-characteristic should be based on the purpose of the taxonomy. (…) The purpose of the taxonomy should, in turn, be based on the expected use of the taxonomy and thus could be defined by the eventual users of the taxonomy."* (Nickerson et al. 2012 p. 8)

As we previously noted, the motivation for creating our typology, and thus its *expected use,* is to provide a structural foundation for analyzing the socio-technical design of different crowdsourcing information system types. Socio-technical approaches, as stated above, are applied to align the design of individual system components with each other and with the organizational context. Accordingly, Ackoff (1993; cited in Silver et al. 1995) states that a system cannot be understood by analyzing its constituent parts alone, but only by determining its function in the supersystem. Any information system therefore needs to be first considered in terms of its function within the organizational environment in order to derive details on its "features and component parts" and how they enable this organizational function (Silver et al. 1995). The *purpose* of our typology is therefore to distinguish archetypes of crowdsourcing information systems based on their organizational function.

In the work system definition, the generic function of any information system in an organizational context is the processing of information in order to produce informational products and/or services for internal or external customers. As opposed to 'traditional' information systems, however, the product or service that is produced in a crowdsourcing information system – and thus its specific organizational function – is essentially determined by contributions from the crowd. In line with the purpose of our typology, the *meta-characteristic* that we apply to distinguish crowdsourcing information systems therefore considers how a system makes use of crowd contributions to achieve its organizational function.

As suggested by Nickerson et al., we proceeded by employing an iterative combination of empirical-to-conceptual and conceptual-to-empirical approaches. On the empirical side, this process involved the analysis of various samples of crowdsourcing information systems, starting with systematic samples in early iterations and concluding with random samples to validate the robustness of our typology. The complete sample set comprises nearly fifty systems. On the conceptual side, we drew some inspiration from concepts used in systems theory and from existing distinctions of the crowdsourcing landscape in academia and industry. The chosen iterative method involved a broad consideration of candidate dimensions, which were tested for their individual relevance to the meta-characteristic and their collective distinctive potential. Nickerson et al. provide a number of objective and subjective criteria that serve as both ending conditions for the development process and evaluation criteria for the resulting artifact. The next session presents this artifact, followed by a brief discussion of its compliance with the evaluation criteria.

Four Archetypes of Crowdsourcing Information Systems

Our current typology aims to sufficiently cover the specified meta-characteristic – i.e., how a crowdsourcing information system makes use of crowd contributions to achieve its organizational function – by differentiating two fundamental dimensions: (i) whether a system seeks homogeneous or heterogeneous contributions from the crowd and (ii) whether it seeks an emergent or a non-emergent value from these contributions.

(i) A system that seeks *homogeneous* contributions values all (valid) contributions equally. Homogeneous contributions that comply with the predefined specifications are seen as qualitatively identical; the system is geared to mere quantitative processing. In contrast, a system that seeks heterogeneous contributions values these contributions differently according to their individual qualities. Heterogeneous contributions are seen as alternatives or complements and are processed accordingly. This dimension is inspired by the notion of heterogeneous components (or components perceived as such), which is studied in various systems (Heinrich et al. 2011 p. 16). A particular focus on heterogeneity can be found, e.g., in the context of distributed computer systems (Maheswaran et al. 1999) or agent models in economic systems (Hommes 2006).

(ii) A system that seeks a *non-emergent* value from its contributions derives this value directly from all or some of the individual contributions in isolation. In such systems, an individual contribution delivers a fixed value, which is independent of other contributions. A system that seeks an *emergent* value from its contributions, however, can only derive this value from the entirety of contributions and the relationships between them. An individual contribution therefore only delivers value as part of the collection of contributions as a whole. Emergence is a philosophical concept that is, among others, central to systems theory to denote properties of a system that are not possessed by its isolated components but rather depend on the relationships among them in a composition (Bunge 2003 p. 12ff.; Checkland 1988 p. 243; Heinrich et al. 2011 p. 15; Weber 1997 p. 37).

The combination of these two dimensions yields four fundamental types of crowdsourcing information systems. Every type represents an archetypal system with a distinct organizational function. We gave each system type a label that describes this function and, accordingly, the type of product or service delivered by the system. Figure 1 illustrates the four types of systems as well as their organizational functions.

Crowd processing systems rely on large quantities of homogeneous contributions and seek non-emergent value that derives directly from the individual contributions. All valid contributions that comply with the corresponding specifications are considered qualitatively identical and thus deliver the same individual value. These systems utilize the additional bandwidth and the scalability provided by a crowdsourcing solution for quick and efficient batch processing. Contributors collectively process tasks in large quantities to minimize the use of traditional organizational resources (Doan et al. 2011). Many such systems apply a divide and conquer approach by splitting up large jobs into equal chunks of work ('micro-tasks') and by combining the resulting individual contributions to deliver a collective result. Examples for crowd processing systems are Camclickr, Galaxy Zoo (Lintott et al. 2008), Recaptcha (von Ahn et al. 2008), and VizWiz (Bigham et al. 2010).

Crowd rating systems also rely on large quantities of homogeneous contributions but seek a collective value that emerges only from the totality of contributions and all their relationships. As homogeneous contributions are considered qualitatively identical, the aspired value emerges from the mere quantitative properties of the collection of contributions. Individual contributions therefore represent 'votes' on a given topic. Only the aggregation of a sufficient number of these votes allows the deduction of a collective response such as a spectrum of opinions or collective assessments and predictions that reflect the "wisdom of crowds" (Surowiecki 2005). Large crowds of contributors with diverse knowledge and backgrounds therefore enable crowd rating systems to obtain increasingly accurate results. Such systems are used, for example, to collect review ratings (eBay reputation system), in online opinion panels (eRewards), or on prediction markets (Hollywood Stock Exchange, crowdcast).

Crowd solving systems seek non-emergent value that derives directly from the isolated values of their heterogeneous contributions. The value of an individual contribution's qualitative properties is determined with respect to certain evaluation criteria and can vary greatly – from irrelevant to seminal. The contributions in such systems, consequentially, represent alternative or complementary solutions to a given task or problem. Similar to crowd rating systems, crowd solving systems benefit from larger and more diverse crowds as every contribution potentially (but not necessarily) increases the solution quality; a phenomenon which some people refer to as the "wisdom in the crowd" (Dondio and Longo 2011 p. 113). They are built on the premise that the "open call" (Howe 2009) to a large enough crowd, whose individuals possess diverse knowledge, experiences, and skills, will eventually turn up the 'right' contributions. Crowd solving systems can be built around 'hard' problems of mathematic or algorithmic nature that feature objective and well-defined evaluation criteria with prominent examples such as the Netflix Prize (Bennett and Lanning 2007), FoldIt (Cooper et al. 2010), Kaggle, or the Goldcorp Challenge. They can also be used to approach 'soft' problems that do not have an optimal solution and thus feature evaluation criteria that may be subjective or evolve during the process. Examples include ideation platforms such as InnoCentive (Allio 2004) or ideaBounty and 'make-to-order' digital product contests such as 99designs, Naming Force, or TopCoder.

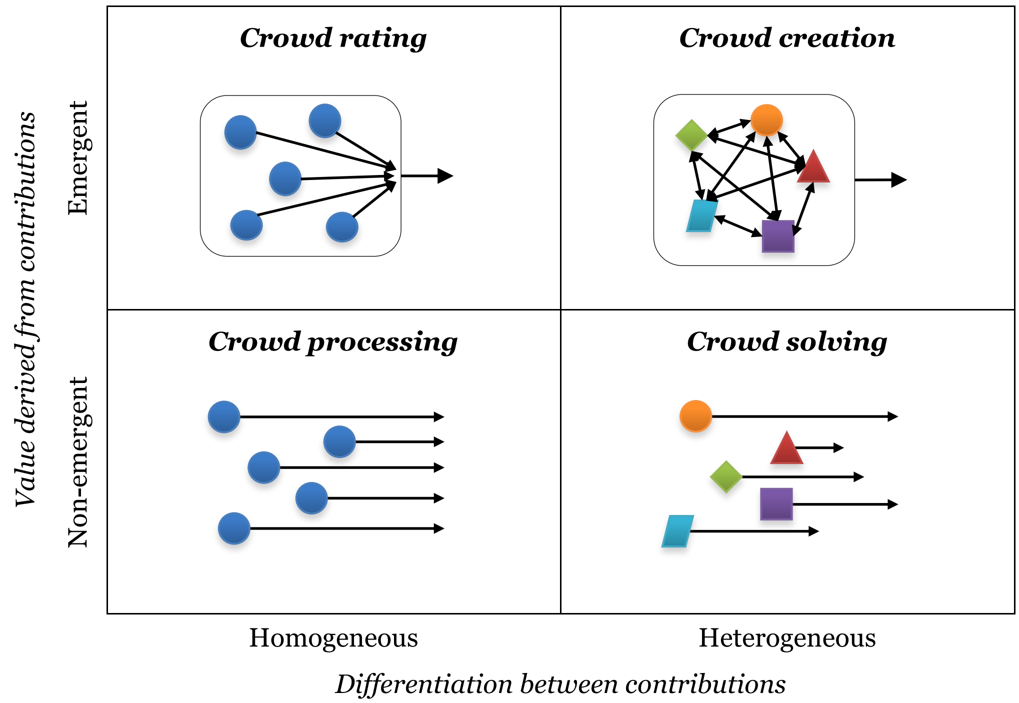

Figure 1. Four Types of Crowdsourcing Information Systems

Crowd creation systems also rely on a variety of heterogeneous contributions but seek a collective value that emerges only from the accumulation of contributions and their relationships. In contrast to crowd rating systems, the aspired value does not focus on the mere quantitative properties of the collection of contributions. It rather emerges primarily from the qualitative properties of the individual contributions and from their relationships with each other. An individual contribution therefore has a complementary share in the creation of a collective outcome. Crowd creation systems are based on large and diverse crowds that enable them to aggregate a variety of contributions into a comprehensive artifact. Examples include all kinds of user-generated content systems (YouTube, the Yahoo! Contributor Network), in particular 'make-to-stock' production of digital content (iStockphoto, App Store) or knowledge aggregation (Wikipedia).

As stated above, the described systems are archetypes with a distinct organizational function. Many crowdsourcing efforts are built on systems that combine some of these functions, often relying on quantitative and qualitative components. For example, most systems that are based on heterogeneous contributions rely on a crowd rating function in form of a collective vote as an indicator for the quality of individual contributions (Dell IdeaStorm, YouTube, iStockphoto, App Store). Some of these systems also make use of crowd processing functions such as tagging in order to organize the set of input elements.

In general, the type of the required system depends on the specific goals of a crowdsourcing project. Projects may appear similar to the outside although they are based on fundamentally different intentions. Consequentially, they may vary in the type of contributions they seek and in the way they derive value from them. An example for that is a crowdsourced translation effort. If the goal of such an effort is to simply get a quick translation, e.g., for on-demand utilization with mobile devices (Liu et al. 2011), a crowd processing system with some kind of basic quality assurance will be used. If the goal, however, is to get a good translation for a productive purpose (e.g., the Facebook translation), a combination of crowd solving and crowd rating functions may be used: Contributors propose qualitatively different translations and vote for the 'best' one among all available alternatives, thus maximizing (subjective) quality.

Evaluation

According to the design science paradigm, a "search for the best, or optimal, design is often intractable for realistic information systems problems" and should instead aim to discover effective solutions (Hevner et al. 2004 p. 88). On this basis, Nickerson et al. (2012) argue that taxonomies can only be evaluated with respect to their usefulness. They propose a set of qualitative attributes that form the necessary conditions for a useful taxonomy: it needs to be concise, robust, comprehensive, extendible, and explanatory.

For the scope of our work, the current version of the typology satisfies these criteria. The number of characteristics is *concise* enough to be easily applied, yet they provide a *robust* differentiation of distinct system archetypes. The typology is *comprehensive* in that it has allowed us to classify every crowdsourcing system in our samples. While future work could certainly *extend* the typology and thus identify additional (sub)systems, the current version has sufficient *explanatory* power with respect to the essential crowdsourcing mechanisms and the organizational functions of the classified system instances.

In addition to these generic, necessary conditions, however, Nickerson et al. note that the sufficient conditions for usefulness depend on the expected use of a specific taxonomy. As taxonomies are not an end in themselves, their usefulness can only be evaluated by observing their use over time, with regards to their respective purpose. Following that idea, we proceed by applying our typology to the comparative study of the socio-technical design of the four crowdsourcing information system archetypes. In combination with a future classification of extended sample sets, this will, in time, reveal any potential for improvement and enable us to further refine the framework.

Designing Crowdsourcing Information Systems

Having determined these fundamental types and functions of crowdsourcing information systems, we are now able to derive implications for their respective design in order to increase the chance of a successful crowdsourcing effort. From a socio-technical perspective, the design of a system is reflected in the design of its components and their relationships. Every design decision therefore needs to consider all the components that it affects in an integrated manner. Following the work systems definition, these components include the performed activities, the processed and/or contributed information, the involved participants, and the supporting technology.

By considering individual archetypes of crowdsourcing information systems, which have distinct organizational functions and, thus, rely on contributions from the crowd in different ways, we can directly determine certain characteristics of the system components, e.g., the type of work performed in a system or the nature of the contributed information. As the components of a system are all directly or indirectly related with each other, we can draw on these characteristics to derive guidelines for the design of other components such as the supporting technology.

Ultimately, the combination of a socio-technical work systems perspective with an archetypal distinction of crowdsourcing information systems will provide a foundation towards the development of a design theory for these systems (Gregor and Jones 2007). In the context of this research-in-progress paper, we demonstrate our approach by focusing on how crowdsourcing information systems capture crowd contributions. We exemplarily highlight some characteristics and design guidelines with respect to the individual system components. Where possible, we draw on existing knowledge and classifications from the crowdsourcing literature.

Capturing Crowd Contributions

All crowdsourcing information systems rely primarily on some kind of contributions from the crowd in order to produce an informational product or service. At some point, every system design therefore includes an activity for capturing these contributions. Depending on the particular system type, however, this activity differs in how it is realized by the other system components, namely participants, information, and technology. Table 1 provides an overview of some of the aspects that are discussed in the following.

Participants

Depending on the organizational function of a crowdsourcing system, the role and nature of its crowd contributors can differ substantially. Doan et al. (2011) identify four basic roles that contributors can take in a crowdsourcing system. Firstly, contributors can provide different perspectives, e.g., in the form of reviews or predictions. Secondly, they can provide self-generated content such as videos, images, or texts.

Thirdly, the contributors themselves can function as components of a system, e.g., by interacting in a social network or by forming a user community. Fourthly, humans can be used as workers towards solving problems in a divide-and-conquer approach.

The nature of the contributors in a crowdsourcing system correlates strongly with the characteristics of the tasks performed. Rouse (2010) states that simple tasks, on the one hand, can be accomplished with moderate education and training. Sophisticated tasks, on the other hand, may require substantial domain knowledge and business acumen. Focusing on outsourcing labor to the crowd, Corney et al. (2009) distinguish tasks that anyone can perform (e.g., image-tagging), tasks for most people (e.g., rating certain products), and expert tasks, which require specific abilities, specializations, or skills. A similar distinction of performers is employed by Zwass (2010). It includes the world, i.e., any individual, community members, skilled contributors, and prequalified individuals.

Contributors in a crowd processing system take the role of workers processing simple tasks in batches. These systems harness basic human capabilities to mechanically process small tasks, which cannot (efficiently) be processed by computers alone. Crowd processing systems therefore do not require any special skills or knowledge from their contributors. This is similar for most crowd rating systems, in which contributors act as perspective providers. In some cases, however, participants can only provide relevant perspectives to these systems if they are familiar with a particular item, issue, or domain. Contributors in crowd solving and crowd creation systems act as providers of self-generated heterogeneous content, which takes various forms such as images, algorithms, or text. Whether this content is used to solve a specific problem or as part of a collective artifact, these systems require contributors with a particular skillset or domain knowledge.

Information

Crowd processing and crowd rating systems seek to capture large quantities of homogeneous contributions. The individual impact of a contribution and thus the structural complexity (Zwass 2010) of the contributed information is low. In crowd rating systems, which value contributions merely as quantitative votes, even the domain of the contributed information (i.e., the permitted values) is predefined. The structural complexity of information contributed to crowd solving and crowd creation systems, in contrast, is potentially high due to the emphasis on individual qualities.

In order to capture valid information from their contributors, crowdsourcing systems also need to provide certain information on the respective task. This information needs to be more specific in those systems

Table 1. Capturing Crowd Contributions

	Crowd processing	Crowd rating	Crowd solving	Crowd creation
Participants	Workers	Perspective providers	Providers of self-generated content	Providers of self-generated content
	Mostly only basic human capabilities required	Specific knowledge required for some tasks	Particular skillset or domain knowledge required	Particular skillset or domain knowledge required
Information	Capture information of low structural complexity	Capture information of low structural complexity; predefined contribution domain	Capture information of potentially high structural complexity	Capture information of potentially high structural complexity
	Provide specific information to be processed	Provide 'rating question'	Provide (specific) evaluation criteria	Provide general guidelines
Technology	Support for batch processing	Support for automated aggregation One contribution per participant	Support for comparative selection	Support for (manual) integration

that seek to derive isolated value from individual contributions, than in those that seek an emergent value from the collection of contributions. While crowd processing systems supply their participants with specific chunks of information that need to be processed, e.g., in form of images or datasets, crowd solving systems need to provide evaluation criteria that are as specific as possible in order to generate adequate solutions. Contrary to that, the information provided to contributors in crowd rating systems is a "non-codified" (Alter 2010) description of the rating object, usually in form of a question. Similarly, crowd creation systems in most cases merely specify guidelines that individual contributions should adhere to.

Technology

Crowd processing and crowd rating systems need to provide well-defined interfaces that reduce the risk of structural variations in otherwise homogeneous contributions and thus capture the contributions in a way that can be easily aggregated. The interfaces in crowd processing systems need to provide support for batch processing by iterating through the individual tasks and by encouraging results that can be easily combined, if necessary. Interfaces in crowd rating systems need to provide selectable options or strict definitions of allowed inputs that enable an automated aggregation of the contributed perspectives. They also need to ensure that every participant can only contribute once to a specific rating task.

Crowd creation and crowd solving systems must allow for higher degrees of freedom with respect to the contribution of heterogeneous input. Nevertheless, user interfaces for such systems will need to define some requirements on the structural form of contributions (e.g., text or an image format). In crowd solving systems, it is necessary to ensure that the (alternative) solutions that are captured on a specific problem can be easily compared with each other (e.g., a number of competing designs or algorithms). In crowd creation systems, the interface must support the integration of multiple contributions into a joint artifact. Some crowd creation systems provide participants with means to influence the integration such as choosing categories or attaching tags (e.g., iStockphoto); others enable their participants to manually weave their contributions into the collective artifact (e.g., Wikipedia).

Conclusion

The aim of this research is to contribute towards a more theory-inspired and integrated study of crowdsourcing systems. To this intent, we have developed a definition that is based on a socio-technical information systems perspective and that takes into account the characteristics of crowdsourcing approaches. In particular, we have defined crowdsourcing information systems as a special type of work systems that produce informational products or services by relying primarily on contributions from the crowd. By distinguishing how they make use of these contributions to achieve their organizational functions, we were able to develop a typology of fundamental system archetypes. Finally, we demonstrated how the resulting distinction will, in combination with the work systems approach, lead to a deeper understanding of the design requirements of these systems.

By applying further insights from socio-technical design and work system analysis, the next steps within this research project will thus be aimed at developing a comprehensive picture of the activities in crowdsourcing information systems and of how they are implemented by the individual components. While a detailed analysis of individual cases is one of the primary avenues to the further development of our framework, we will also need to strengthen the empirical support by regarding larger sample sets.

The contributions of this work and its applications are threefold: Firstly, the sociotechnical systems perspective lays a foundation for IS-based crowdsourcing research, which can draw on a multitude of insights from other IS research streams such as IS development or IS failure. Secondly, the typology of system archetypes can serve as a framework to channel and relate crowdsourcing research activities. Thirdly, insights from the sociotechnical systems perspective and the developed typology can assist researchers and practitioners in the design of particular crowdsourcing solutions.

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