# Internal Crowdsourcing: Conceptual Framework, Structured Review and Research Agenda

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# Internal Crowdsourcing: Conceptual Framework, Structured Review and Research Agenda

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**Abstract:** The use of IT-enabled crowdsourcing with employees in enterprises has increased substantially in recent years. This phenomenon, which we refer to as "internal crowdsourcing", is distinct both from external crowdsourcing with end users and from hierarchy-based work with employees. A literature stream has emerged that corresponds with the increased relevance of internal crowdsourcing in practice. The purpose of this review paper of internal crowdsourcing is to provide conceptual development, synthesise the literature and provide a research agenda. In the review reported in this paper, we systematically analysed and critically reviewed the literature in this domain published thus far (74 papers). We found useful findings and insights into a new and relevant IT-enabled phenomenon. At the same time, we also found conflicting definitions and conceptualisation, as well as research efforts that are not well integrated. The paper supports future research

on internal crowdsourcing by providing improved conceptualisation, consolidating insights, and identifying important areas for future research.

# 1.    Introduction

The use of "social" information technology (IT) in enterprises (and other organisations) has increased substantially in recent years. As this special issue highlights, the use of social IT and the enterprise social systems they enable are gradually transforming organisational processes and structures (e.g., Chui et al., 2013; McAfee, 2009; Leonardi, et al. 2013). Social IT changes how enterprises interact externally with their customers and internally with employees (organisational members) (Aral et al., 2013). In a recent study, 82 per cent of enterprises surveyed systematically used of social IT (Bughin et al., 2013). At the same time, very few enterprises are able to unlock the full potential of social IT, which several analyses suggest lies in its internal rather than external use (Aral et al., 2013; Hu & Schlagwein 2013; Koch et al., 2012).

"Crowdsourcing" idea generation and other tasks for end users is one new organisational process enabled by social IT. Crowdsourcing leverages the work or the ideational potential of a large group of people for a sponsor using an open call to contribute via the Internet (Estellés-Arolas & González-Ladrón-de-Guevara, 2012). Forms of "external crowdsourcing" with end users (independent external people[1]), has been documented at enterprises including LEGO (Schlagwein & Bjørn-Andersen, 2014), Philips Healthcare (Ågerfalk & Fitzgerald, 2008) and SAP (Leimeister et al., 2009).

Even more recently, "internal crowdsourcing" with employees has seen a substantial uptake in practice and has attracted a first wave of research papers and dedicated studies. The alternative term "enterprise crowdsourcing" can be misleading because it has been used for both internal crowdsourcing as well as for crowdsourcing by an enterprise in general (internal or external) (Hetmank, 2014). We use the term "internal crowdsourcing" to refer, as a working definition, to crowdsourcing in an enterprise involving only employees (we refine this definition below). Forms of internal crowdsourcing with employees have been documented at enterprises including Deloitte (Riemer & Scifleet, 2012), Deutsche Telekom (Rohrbeck et al., 2015) and IBM (Bailey & Horvitz, 2010; Muller et al., 2013).

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[1] To make reading of this paper easier, we consistently use the terms "enterprises" to refer to business enterprises and organisations more broadly, "employees" to refer to members of such enterprises or organisations, and "end users" to mean independent external people such as costumers, consumer or the general public.

What exactly is internal crowdsourcing? What do we know about internal crowdsourcing? Where are we lacking knowledge about internal crowdsourcing? These three questions framed our structured review of 74 research papers covering internal crowdsourcing published up to August 15, 2015. Internal crowdsourcing has several unique properties that make it a distinct from other forms of crowdsourcing and it hence requires a dedicated analysis. For example, "the crowd" in internal crowdsourcing is made up of identifiable employees (rather than independent end users as in external crowdsourcing), competitive and confidential issue can be addressed in internal crowdsourcing (which would not be suitable for external crowdsourcing) and there is the need in internal crowdsourcing for change and culture management skills (but no external community engineering, management, and communication skills). We discuss these and other characteristics of internal crowdsourcing in the analysis below.

The paper is organised as follows. Section 2 explains our literature search and review method. Section 3 presents the conceptual framework of internal crowdsourcing that served as the structure for our review of the state of knowledge. Section 4 then presents the actual review and synthesis of the internal crowdsourcing literature. The section also provides a direct comparison of internal crowdsourcing to external crowdsourcing and to hierarchy-based work with employees. Section 5 highlights gaps in our understanding of internal crowdsourcing and proposes a research agenda. The paper concludes with a brief summary.

## 2.    Search and Review

Our literature review was a structured review with the aim to better describe the domain of internal crowdsourcing and synthesise the relevant knowledge as available in peer-reviewed published research (one of the review genres described in Rowe 2014). For the structured literature review, we followed best practices for literature reviews accepted in the Information Systems (IS) discipline (Schryen 2013; Webster & Watson, 2002).

First, we performed a keyword-based search (Kitchenham 2004, 2007). The purpose of the keyword-based search was to find papers that self-identified as being concerned with internal crowdsourcing. Second, we performed a concept-centred search (Webster and Watson 2002). The purpose of this search was to identify papers that did not use the term, but nonetheless were about the concept internal crowdsourcing. In addition, we used other

(non-systematic) methods of identifying relevant papers (e.g., our knowledge of internal crowdsourcing in research and in practice).

## Keyword-Based Search

We used a search method adapted from Barbara Kitchenham's (2004, 2007) systematic literature review. We found that the benefit of a keyword-based literature search in as a starting point was that it did not bias our initial selection towards well-known authors, particular journals or well-cited (older) papers. The keyword-based search considered all peer-reviewed papers indexed by the leading academic databases as equal in the first instance.

To perform the keyword-based search(es), we identified a set of keywords through an initial step of probing searches, discussion in the research team and conceptual mapping exercises. This initial step resulted in a set of search terms that considered alternative terms for "internal" (e.g., "business", "enterprise" or "corporate") and alternative terms for "crowdsourcing" (e.g., "co-creation", "collaboration" or "crowdfunding"). For the actual searches, we used all possible combinations of terms in the "enterprise" group with search terms in the "crowdsourcing" group. We refined our keywords based on the results to improve our conceptualisation of internal crowdsourcing.

We used the academic databases Academic OneFile, EBSCO BusinessHost, Science Direct, and Scopus for the keyword-based search. We conducted the final keyword-based search on August 15, 2015. This step resulted in a total of 20,974 hits across all databases (this high number of hits is not unusual for keyword-based searches, Boell & Cecez-Kecmanovic 2015a).

For the search results, we use three inclusion/exclusion criteria (in addition to removing duplicates and non-peer-reviewed articles) with the goal of providing a comprehensive but also specific set of papers for our analysis. We considered journal papers published after January 1, 2006 (the rationale being that the underlying phenomenon has changed substantially over the past decade) and conference papers published after January 1, 2010 (the rationale being that recent research may not yet have been, or may never be, published in journals) and removed older papers. Furthermore, we considered work published in peer-reviewed journals and conferences of a "B", "A" or "A*" standing in the academic

community (ARC 2011a,b).[2] After applying these inclusion and exclusion criteria, 307 papers remained.

The papers' content had to be about "internal crowdsourcing" (as per our above working definition). We excluded papers about other topics and papers that referred to internal crowdsourcing only in passing. We did, however, include papers in which crowdsourcing was used internally and externally, or where crowdsourcing was implicit and part of general social IT use in in the organisation. In such papers, we focused only on the insights relevant for internal crowdsourcing. This selection process was a qualitative assessment we made based on our reading. 32 papers met all criteria and provided us with a first set of papers to be included in the review.

## 2.2 Concept-Based (Forward/Backward) Search

As mentioned above, we considered that not all relevant papers on the *concept* of internal crowdsourcing could be identified through searches based on the *term* internal crowdsourcing (for a recent debate in the *Journal of Information Technology* on the usefulness and limitations of keyword-centric "systematic literature reviews" see Boell & Cecez-Kecmanovic 2015a,b). Hence, we conducted a concept-based search using backward and forward searches (Webster & Watson, 2002) of the above 32 papers. We found this approach quite effective for identifying further relevant literature.

For the backward searches, we examined the 32 papers for citations of earlier sources and then obtained copies of cited sources that we considered potentially relevant (based on the title or how the cited source was discussed in the citing paper). We then checked these papers against our above inclusion and exclusion criteria. For the forward searches, we looked for later sources that cited the 32 papers. This was possible with the "cited by" functions of Google Scholar. Again, we obtained copies of citing sources that we considered potentially relevant and checked them against our inclusion and exclusion criteria. Finally, we again used all papers that we identified as relevant for forward and backward searches until no additional papers could be identified. In total, we checked

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[2] The ARC (Australian Research Council)'s "Excellence in Research for Australia 2010" reports rated (all) academic journals and conference and they are the most comprehensive of such assessment reports available. The Australian Research Council has released a newer assessment report (2014) that does not include ratings. We used outlet ratings for our review because they were helpful as a first indication of quality of outlets unknown to us (i.e., we acknowledge that there are problems and shortcomings with such rating approaches in general).

4,976 papers in this step (762 papers from the backward search, and 4,214 papers from the forward search). We identified an additional 37 relevant papers to be included in the review.

## 2.3 Non-Systematic Search

We also considered papers not identified through either the keyword- or concept-based searches. These other search forms included working with internal crowdsourcing in research and practice, reading of reviews of tangential domains, and receiving recommendations and suggestions through other channels. We considered these papers using the same inclusion and exclusion criteria. In total, we identified an additional five papers not already covered by the previous two search forms.

In total, hence, we identified 74 papers on internal crowdsourcing, including papers on internal crowdsourcing as part of broader crowdsourcing and social media use if they provided relevant insights. Table 1 summarises the search forms and the number of papers they identified.

| Search Strategy | Hits | Meeting Criteria | Relevant |
|---|---|---|---|
| Keyword-based | 20,976 | 307 | 32 |
| Concept-based | 4,976 | 753 | 37 |
| Other | n/a | n/a | 5 |
| Total | | | 74 |

**Table 1: Search Forms and Number of Papers Identified for Review**

The remainder of this paper provides an analysis and review of the 74 papers henceforth referred to as the "set of papers".

We reviewed the set of papers using open coding (a standard method of coding text according its contents and themes, Ezzy, 2002) of their contents, with particular attention to attributed characteristics, explicit and implicit definitions, and substantive findings and insights relevant for internal crowdsourcing. It is worth noting that while this paper is necessarily presented in a linear structure, our review process was iterative, not linear. That is, we did not begin with any preconceived endpoint, but instead developed the definition, conceptualisation, and inclusion and exclusion criteria through the review process.

# 3.    Internal Crowdsourcing Definition and Framework

As generally considered useful for phenomenon (empirical domain) focused literature reviews (Rowe, 2014), we use a clear definition of the focal phenomenon, internal crowdsourcing, and a conceptual framework to structure the review.

After having reviewed the set of papers, we were able to refine our above working definition of internal crowdsourcing to the following: **Internal crowdsourcing is an (a) IT-enabled (b) group activity based on an (c) open call for participation (d) in an enterprise.**

This definition (bold text) is our own, but corresponds to the characterisation of internal crowdsourcing in the reviewed literature. The analytical process to develop this definition was as follow: we cross-compared the papers, aided by our own open coding, to identifying the characteristics consistently versus inconsistently attributed to internal crowdsourcing. For example, that internal crowdsourcing is "IT-enabled" was consistent across all the set of papers reviewed (i.e., can be held a common characteristic, and is hence part of our definition). In contrast, that internal crowdsourcing is necessarily "paid for" was *not* consistent across the set of papers reviewed (i.e., cannot be held a common characteristic, and is hence not part of our definition).

Table 2 shows how the characteristics of internal crowdsourcing in our definition correspond to the reviewed set of papers. (We performed this analysis for all papers, and the table provides three examples for illustration.)

**Table 2: Definition Elements of "Internal Crowdsourcing" vis-à-vis Example Sources**

| Example | "IT Enabled" | "Group Activity" | "Open Call" | "In Enterprise" |
|---|---|---|---|---|
| Benbya & Van Alstyne (2010) | "… typically [based on] an IT-supported platform …" (p. 65) | "… connect users to experts …" (p. 65) | "… requires an open organization where employees can deliberate, argue, compete and collaborate horizontally …" (p. 11) | "… internal knowledge markets …" (p. 65) |
| Simula & Ahola (2014) | "… [uses an]online community …" (p. 402) | "… collaboration in networks …" (p. 403) | "… typically, there is no selection mechanism and internal idea competitions are open to all employees of a | "… the focal firm leverages internal actors … with whom it is connected via an employment relationship …" (p. 403) |

| | | | firm…" (p. 402) | |
|---|---|---|---|---|
| Standing & Kiniti (2011) | "… wiki[s] operate on a web browser …" (p. 292) | "… emphasis on team work and group effort rather …" (p. 293) | "… open to all employees …" (p. 291) | "… Focal firm and its employees …" (p. 289) |

Our definition of internal crowdsourcing has four components (a-d) according to the set of papers (specific sources are discussed in the following section). First, as with crowdsourcing in general, internal crowdsourcing is an (social) **IT-enabled** phenomenon. We found in the review that IT used includes both generic social media (wikis, blogs, social networking sites) and dedicated specialist tools for crowdsourcing. Second, internal crowdsourcing is a **group activity**. There are collaborative, competitive, or networked modes for that activity. Third, internal crowdsourcing is based on an **open call**. This call might be explicit (e.g., an explicit tender) or implicit (e.g., through an inherently open technology such as an internal social networking site that "invites participation"). Finally, internal crowdsourcing takes place **in an enterprise**. Internal crowdsourcing could run in isolation, or in combination with external crowdsourcing.

Furthermore, we aimed to synthesise the literature according to a framework that allows us to structure the review of important components of the phenomenon internal crowdsourcing (i.e., we are using a concept-focused structure, not using a paper or author-focused structure) (see further Rowe 2014, Webster & Watson 2002).

Accordingly, the purpose of the framework below is to support a better conceptual understanding of internal crowdsourcing as well as to provide a structure for our analysis of the identified set of papers. The process to arrive at this conceptual framework was as follows: we cross-compared the papers and their focus, aided by our own open coding, to identifying what types of concepts the paper makes claims about in relation to internal crowdsourcing. Mapping these concepts against existing frameworks, we found that the general crowdsourcing framework of Pedersen et al. (2013) provided a useful starting point for our grouping of these concept and claims. However, we made several changes to their framework so to suit the needs of our review. The final framework that we use in this paper is shown in figure 1.
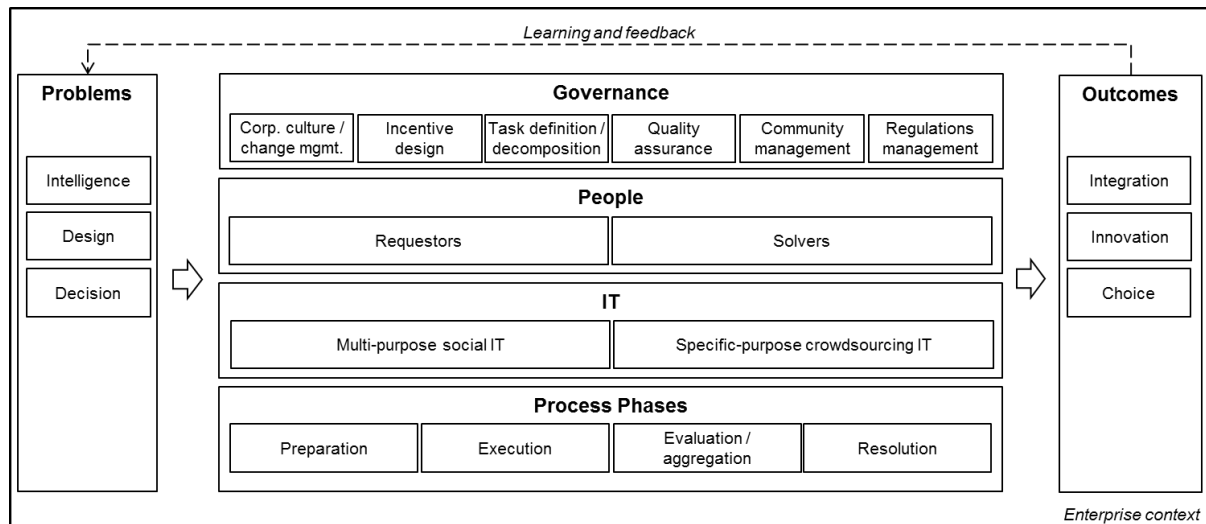
**Figure 1: Conceptual Framework for Internal Crowdsourcing Review**

The internal crowdsourcing in figure 1 has six main components (areas of insights and research focus) according to our review of the set of papers (again, specific sources are discussed in the following section). The **problems** component covers the insights with respect to the problems suitable for internal crowdsourcing (i.e., providing its *raison d'être*). We found in the review that (collective) intelligence problems, design problems and/or decision problems can be addressed with internal crowdsourcing.

The **governance** component cuts through the internal crowdsourcing phenomenon in terms of governance and management tasks. Governance covers tasks such as management of corporate culture and change, incentive design, task definition and decomposition, quality assurance, community management, and management of regulations and legal implications.

The **people** component encompasses insights regards those involved with internal crowdsourcing. While the groups may overlap, some individual typically takes on the role of requestor or solver. The **IT** component concerns the types of IT used for internal crowdsourcing. As above, internal crowdsourcing is based either on generic social IT or IT specifically developed for crowdsourcing.

The **processes** component cuts through the phenomenon along the timeline (i.e., covers insights regarding internal crowdsourcing seen as a process). The crowdsourcing process can be structured in preparation, execution, evaluation/aggregation, and resolution phases.

Finally, the **outcome** component covers the outputs from internal crowdsourcing. Corresponding to the problem types, we found in the review that the outcomes of internal crowdsourcing are integrations, innovations, and/or choices.

Furthermore, in figure 1, the dotted arrow indicates a learning and feedback loop (enterprises learn over time). The box indicates the importance of the enterprise context.

# 4.    Analysis and Review

In this section, we discuss the state of knowledge regarding internal crowdsourcing documented in the set of papers in the structure of the above conceptual framework. For each component of the framework, we first provide an overview of findings and insights in detail, summarise these findings in a table, and then compare internal crowdsourcing to external crowdsourcing and hierarchy-based work. The tables are structured as follows: The first column delineates the sub-themes within the component (e.g., the different problem types within the problem component). The second column summarises relevant findings and insights (some have been made specifically on internal crowdsourcing, some are insights relevant for crowdsourcing or social IT in general). The third column lists all sources we recommend to scholars interested in researching the respective component. This very structured form of presentation is aimed at assisting future researchers interested in internal crowdsourcing so they may use this review as a repository of relevant insights and literature sources for their particular area of research; we hope to save them substantial time (this review paper involved two years of work) and increase our shared conceptual understanding of, and knowledge about, internal crowdsourcing.

## 4.1. Problems Addressed with Internal Crowdsourcing

By "problem", we mean "a statement of the initial condition and the desired ending condition" of internal crowdsourcing (see also Pedersen et al., 2013). According to the reviewed literature, three different problem types can be addressed with internal crowdsourcing.

The first type of problem internal crowdsourcing addresses is (collective) "**intelligence**". For example, internal crowdsourcing has been documented to forecast product demand (Stieger et al., 2012) and project completion dates (Malone et al., 2009). Generally, the larger and more segmented an enterprise, the more difficult it is to match people to

problems (Simula & Vuori, 2012; Benbya & Van Alstyne, 2010). Internal crowdsourcing solves this and allows enterprises to bring together knowledge and information that may be scattered among different groups, locations, hierarchies or departments (Benbya & Van Alstyne, 2010; Lin & Ehrlich 2012; Lopez et al., 2010; Gaspoz, 2011; Guy et al., 2015; Riemer & Scifleet, 2012; Stieger et al., 2012). Thereby, internal crowdsourcing increases social interaction, leading to higher social capital of those involved that can in turn positively affect the overall knowledge quality in the enterprise (Bharati et al., 2015). Because of its short-cycle nature, internal crowdsourcing can support requests where such information or knowledge is needed *ad hoc* to address an immediate problem (Riemer & Scifleet, 2012; Gaspoz, 2011). IBM, for example, has been able to mobilise thousands of employees and affiliated contributors to participate in its Innovation Jams to generate a plethora of ideas in less than a week (Bjelland & Wood, 2008). Similarly, Deutsche Telekom launched an internal crowdsourcing initiative to integrate the knowledge and experience of its employees, resulting in more than 18,000 contributions collected and processed in just four days (Hoerbelt, 2013). Internal crowdsourcing also helps reveal "non-discoverable knowledge" (Laredo et al. 2012), that is, collective, tacit or unstructured knowledge that could not be found through automated methods and systems (see further Vukovic & Stewart, 2012).

Internal crowdsourcing does not need to involve the complete enterprise. Particular enterprise functions may use internal crowdsourcing to address their specific needs in regard to their specific intelligence problems. For example, sales and marketing may be interested in collecting and discussing customer information (Standing & Kiniti, 2011), whereas customer support may be interested in sharing information about work-around solutions and internal experts (Lopez et al., 2010).

The second problem area internal crowdsourcing addresses is **design**. Internal crowdsourcing can make the commercialisation of ideas (i.e., developing products) more efficient (Bjelland & Wood, 2008). Internal crowdsourcing leverages employees outside the formal job hierarchy as a source of ideas for how to improve existing products, services and processes (Simula & Vuori, 2012) or how to create new products, services or processes (Erickson et al., 2012b; Simula & Ahola, 2014; Soukhoroukova, 2012). Internal crowdsourcing provides ways for employees to reach a wider audience, including management, with their ideas. When used for non-routine tasks, internal crowdsourcing may have positive effects on innovation performance as the interconnectivity and

interactivity provided by social IT allows for new, effective forms for generating ideas and designing solutions (Erickson et al., 2012b; Soukhoroukova, 2012). Internal crowdsourcing is not limited to operational work: some enterprises even co-create their strategy using internal crowdsourcing (Jette at al., 2015; Stieger et al., 2012). IBM's Innovation Jams are an example of a very successful implementation of internal crowdsourcing: in each "jam", a crowd of employees collectively brainstorms and develops new business ideas (Bjelland & Wood, 2008).

The third problem area internal crowdsourcing addresses are **decisions** regarding existing alternatives. While choosing the right idea may be crucial, many firms lack a coherent or systematic decision process for ideas (Soukhoroukova, 2012). In internal crowdsourcing, involving the crowd of employees leads to good choices in a systematic process and, as a side effect, increases the identification of employees with those choices (Malone et al., 2009). Specifically, voting by the crowd can provide a democratic solution to decision problems in the enterprise (Schneider et al., 2012; Prpic et al., 2015). In internal crowd*funding* projects, a financial contribution can also be seen as a "vote" in favour, weighted by the level of financial commitment (Muller et al., 2013). While the great potential of internal crowdsourcing for decision-making has been acknowledged (Soukhoroukova, 2012; Schneider et al., 2012; Malone et al., 2009; Muller et al., 2013), but we found little research on the topic.

**Error! Reference source not found.** summarises the findings in the set of papers regarding the problems internal crowdsourcing addresses.

|  | Findings: Internal Crowdsourcing… | Recommended Sources |
|---|---|---|
| **Intelligence problems** | ▪ Provides fast access to internal knowledge (e.g., Gaspoz, 2011)<br>▪ Supports integrating distributed information (e.g., Benbya & Van Alstyne, 2010)<br>▪ Fosters improved internal knowledge quality (e.g., Bharati et al., 2015)<br>▪ Can be applied by specific enterprise functions to address their specific needs (e.g., Lopez, et al., 2010)<br>▪ May provide high-quality forecasting and predictions (e.g., Malone et al., 2009) | Benbya & Van Alstyne, 2010; Bharati et al., 2015; Denyer et al., 2011; Gaspoz, 2011; Guy et al., 2015; Lopez et al., 2010; Malone et al., 2009; McAfee, 2009; Riemer & Scifleet, 2012; Schlagwein, et al., 2011; Simula & Vuori, 2012; Standing & Kiniti, 2011; Stieger et al., 2012; Stocker et al., 2012; Vukovic & Naik, 2011; Vukovic & Stewart, 2012 |
| **Design problems** | ▪ Supports the development of product idea (e.g., Bjelland & Wood, 2008) | Bjelland & Wood, 2008; Erickson et al., 2012a; |

| | | |
|---|---|---|
| | ▪ Helps employees to articulate their ideas to wider audiences in enterprises, including management (e.g., Soukhoroukova, 2012) <br> ▪ Allows the co-creation of strategy (e.g., Jette at al., 2015) <br> ▪ Is particular suitable for non-routine tasks (e.g., Kügler et al., 2015) <br> ▪ Enables enterprise-wide "brainstorming" (e.g., Bjelland & Wood, 2008) <br> ▪ Treats design proposals as equal, at least in first instance (e.g., Bjelland & Wood, 2008) <br> ▪ May be in conflict with values underlying traditional enterprise practices (Erickson et al., 2012b) | 2012b; Jette et al, 2015; Kügler et al., 2015; Kügler et al., 2015; Leung et al., 2014; Simula & Ahola, 2014; Simula & Vuori, 2012; Stieger et al., 2012; Soukhoroukova, 2012 |
| **Decision problems** | ▪ May use (crowd) (e.g., Muller et al., 2013) or (crowd) voting (e.g., Malone et al., 2009) as decision mechanisms <br> ▪ Provides a process for selecting best ideas (e.g., Soukhoroukova, 2012) | Malone et al., 2009; Muller et al., 2013; Schneider et al., 2012; Soukhoroukova, 2012; Prpic et al., 2015 |

**Table 3: Problems Addressed with Internal Crowdsourcing**

Generally, we found in the review that there are differences in *what* problems can be addressed in internal crowdsourcing as well as differences in *how* those problems are addressed compared to both external crowdsourcing and hierarchy-based work of employees. For example, in contrast to external crowdsourcing, problems that are mission critical, strategic and otherwise non-publishable (e.g., the question of the appropriate response to a competitor's move, or questions involving knowledge the enterprise wishes to keep proprietary) can be addressed with internal crowdsourcing (e.g., Simula & Vuori, 2012). Further, the nature of crowdsourcing embodies values (openness, transparency, inclusiveness, etc.) that are in contrast, and sometimes conflict with, the values embodied in hierarchy-based work (power division by formal role, bureaucratic control, reliance on expertise, etc.) (see also Erickson et al., 2012b). Finally, as described above, internal crowdsourcing is appropriate for solving intelligence problems that require *ad hoc* solutions, potentially faster so than alternative mechanisms.


### 4.2. Governance of Internal Crowdsourcing

We understand as "governance" all actions and policies used to govern, manage, and steer the crowd and internal crowdsourcing. Largely corresponding to Pedersen et al. (2013) and Zogaj & Bretschneider (2014), we classify the main crowdsourcing governance tasks based on the review as: a) management of corporate culture and change; b) incentive design; c) task definition and decomposition; d) quality assurance; e) community management; and f)

management of regulations and legal implications. In internal crowdsourcing, managers as requestors and organisers typically perform these tasks.

The first governance task in internal crowdsourcing is the **management of corporate culture and change**. This is not a relevant task in external crowdsourcing, but it is an important governance task in an enterprise context. Managers need to account for the cultural settings of an enterprise to decide whether and how to use internal crowdsourcing (Denyer et al., 2011). An open and collaborative culture is necessary for internal crowdsourcing (Schneckenberg, 2009; Simula & Vuori, 2012; Steinhueser et al., 2011; Stocker et al., 2012; Weinberg et al., 2013). Managers and other leaders in the enterprise have to provide solvers with the sense that their ideas are valued (Simula & Vuori, 2012). Again in contrast to external crowdsourcing, long-term employee relationships between organisations and crowds exists and this relationship is a good basis for on-going cooperation (Prpic et al., 2015) and an innovative culture (Erickson, 2012). The open and democratic nature of crowdsourcing affects enterprise hierarchies by enabling users to establish positions of high informal influence (through their contributions) and enabling more egalitarian communication structures (Riemer et al., 2015). The transformation to an open and transparent culture involves careful change management (Abu El-Ella et al., 2013; Milovanović et al., 2012), and requires managers to let go of controlling and monitoring employees (Majchrzak et al. 2009) and rely instead on openness, transparency, and social feedback as alternative mechanisms of coordination.

The second governance task in internal crowdsourcing is **incentive design**. In some of the papers we reviewed, authors consider that incentives and motivations of (salaried) solvers are not major concerns for internal crowdsourcing (Skopik et al., 2012). Some enterprises use normal salary and performance bonuses as mechanisms to incentivise solvers (Lopez et al., 2010). Others, however, suggest that concrete incentives are as important as in other forms of crowdsourcing to achieve and maintain employee engagement (Bonabeau, 2009). That is, internal crowdsourcing should be paid for (Benbya & Van Alstyne, 2010). In addition, solvers are also motivated by gaining recognition within the enterprise (Simula & Vuori, 2012) and through the feeling of being part of a community (Kügler et al., 2013). Visibly involving managers and other leaders in the crowdsourcing activities has a positive impact on the motivation of others to participate (Leung et al., 2014). The incentive design should not be based on comparing solvers' contributions because this may be counterproductive for an open corporate culture (Benbya & Van Alstyne, 2010). To avoid

free-riding, solvers should be rewarded individually rather than giving the same reward to all solvers (Stieger et al., 2012). The relative importance of these different incentives and motivations is not clear in existing research. Some suggest monetary incentives work best (Bailey & Horvitz, 2010; Benbya & Van Alstyne, 2010), while others suggest that non-monetary incentives are more effective (El-Ella et al., 2013; Soukhoroukova, 2012). Malone et al. (2009) found that monetary incentives increase the quantity of responses, while non-monetary rewards increase the quality of responses. As "crowdsourced work" in an enterprise is still "work", though, it needs to be part of the job description and negotiated workload of employees (Hasan et al., 2009).

The third governance task in internal crowdsourcing is **task definition and decomposition**. This involves the definition, decomposition, integration and allocation of tasks in a way that the task can solved in isolation but later be integrated into a complex environment. Defining tasks that are easy to solve in a limited time is particularly successful for crowdsourcing (Lopez et al., 2010). Such tasks should be formulated unambiguously and precisely (Bailey & Horvitz, 2010) and should include a time estimate for completion (Vukovic & Naik, 2011). The formulation should also be placed in relation to the larger context of the enterprise so that solvers see where the task fits into the "big picture" (Simula & Vuori, 2012; Vukovic & Naik, 2011).

The fourth governance task in internal crowdsourcing is **quality assurance**. Quality assurance involves mechanisms to ensure the quality of contributions and outcomes of internal crowdsourcing. The evaluation of contributions is typically based on the crowd's collective opinion (Geiger et al., 2011; Bailey & Horvitz, 2010; Vukovic & Naik, 2011), at least for an initial assessment. More traditional evaluation and quality assurance (formal checks against defined quality criteria), however, is typically performed before outcomes are actually implemented and used (Bailey & Horvitz, 2010). Such traditional evaluation is not only to ensure the quality of the actual solution in relation to its purpose, but also to avoid a perception of low quality of internal crowdsourcing outcomes in the enterprise (as there is a feedback mechanism) (Bailey & Horvitz, 2010).

The fifth governance task in internal crowdsourcing is **community management**. Internal crowdsourcing is either open to every employee or to a preselected group of employees. If participation is not intended to be completely open, the community management uses generic or specific criteria to preselect who may participate (Geiger et al., 2011). Typically,

internal crowdsourcing should be open to all employees because such openness increases the chance of serendipity, for example in idea competitions (Simula & Ahola, 2014). A broad range of participants and diversity of backgrounds is considered good for internal crowdsourcing (Stieger et al., 2012). In any case, the target group for any internal crowdsourcing initiative must be clearly defined and stated (Simula & Vuori, 2012). Furthermore, self-organisational mechanisms and social solutions should be used rather than hierarchies and directive management (Stieger et al., 2012). To address integration problems successfully, early adopters should be recruited to form a critical mass and then motivate other employees (Stocker et al., 2012). Ensuring sufficient skill and expertise levels, critical in external crowdsourcing, may not be an important concern for internal crowdsourcing because the crowd of solvers is naturally limited to the professionals that the enterprise already employs (Skopik et al., 2012).

The sixth governance task in internal crowdsourcing is **management of regulations and legal implications**. Here, standards, policies and rules to control the crowdsourcing project are addressed. Unlike with external crowdsourcing, intellectual property rights are not a major concern with internal crowdsourcing because existing employment contracts apply to it (Simula & Vuori, 2012). However, creating explicit and implicit codes of conduct help govern solvers' behaviours (Bonabeau, 2009). The management of regulations and legal implications is of greater concern with large crowds because the likelihood of issues arising increases with crowd size (Bonabeau, 2009).

Table 3 summarises the findings on the governance of internal crowdsourcing.

|  | Findings: Internal Crowdsourcing… | Recommended Sources |
|---|---|---|
| **Management of corporate culture and change** | • Corresponds to trusting (e.g., Abu El-Ella et al., 2013), collaborative (e.g., Schneckenberg 2009) and outcome-oriented (e.g., Majchrzak et al., 2009) corporate cultures<br>• Needs to be managed in relation to existing employment (e.g., Prpic et al., 2015)<br>• Improves if resulting ideas are valued by management (e.g., Simula & Vuori, 2012)<br>• Allows employees to exercise influence outside the hierarchy and leads to more egalitarian communication structures (e.g., Riemer et al., 2015) | Abu El-Ella et al., 2013; Denyer et al., 2011; Erickson, 2012;  Majchrzak et al., 2009; Milovanović et al., 2012; Prpic et al., 2015; Riemer et al., 2015; Schneckenberg, 2009; Simula & Vuori, 2012; Steinhueser et al., 2011; Stocker et al., 2012; Weinberg et al., 2013; |
| **Incentive design** | • May motivate participation through rewards (e.g., Benbya & Van Alstyne, 2010)<br>• Motivates participation through recognition (e.g., Kügler et al., 2013) | Abu El-Ella et al., 2013; Bailey & Horvitz, 2010; Benbya & Van Alstyne, 2010; Bonabeau, 2009; Zogaj & |

| | | |
|---|---|---|
| | ▪ Motivates participation if top management is involved (e.g., Leung et al., 2014)<br>▪ May need to be based on different incentives for different tasks or types of solvers (e.g., Vukovic & Natarajan, 2013)<br>▪ Should not directly compare performance of solvers personally (e.g., Benbya & Van Alstyne, 2010)<br>▪ May allow for free-riding on other's ideas (e.g., Stieger et al., 2012) | Bretschneider, 2014; Leung et al., 2014; Erickson, 2012; Hasan et al., 2009; Kügler et al., 2013; Lopez et al., 2010; Malone et al., 2009; Simula & Vuori, 2012; Skopik et al., 2012; Soukhoroukova, 2012; Stieger et al., 2012; Vukovic & Natarajan, 2013 |
| **Task definition and decomposition** | ▪ Needs tasks that are focused and clearly explained (e.g., Bailey & Horvitz, 2010)<br>▪ Yet, must communicate the larger context of the needed work/idea/solution (e.g., Simula & Vuori, 2012) | Bailey & Horvitz, 2010, Lopez et al., 2010, 2010, Olsen & Carmel, 2013; Simula & Vuori, 2012; Vukovic & Naik, 2011 |
| **Quality assurance** | ▪ Relies on the crowd for first evaluation (e.g., Geiger et al., 2011)<br>▪ Relies on traditional quality assurance for later evaluation (e.g., Bailey & Horvitz, 2010) | Bailey & Horvitz, 2010; Erickson, 2012; Geiger et al., 2011; Vukovic & Naik, 2011 |
| **Community management** | ▪ Ought to be managed without use of hierarchies or directive management (e.g., Stieger et al., 2012)<br>▪ Requires that early adopters be recruited to create critical mass and to motivate other employees (e.g., Stocker et al., 2012)<br>▪ Has a crowd of sufficient skills and experience (because the crowd consists of employees) (e.g., Skopik et al., 2012)<br>▪ Could be restricted with different criteria to the appropriate sub-crowds (e.g., Geiger et al., 2011)<br>▪ Benefits from a wide range of participants with broad backgrounds (e.g., Stieger et al., 2012) because it increases serendipity (e.g., Simula & Ahola, 2014) | Geiger et al., 2011; Simula & Ahola, 2014; Simula & Vuori, 2012; Skopik et al., 2012; Stieger et al., 2012; Stocker et al., 2012; Weinberg et al., 2013; Skopik et al., 2012 |
| **Management of regulations and legal implications** | ▪ Provides outcomes that are under clear intellectual property rights regimes (e.g., Simula & Vuori, 2012)<br>▪ Requires clear code of conduct (e.g., Bonabeau, 2009) | Bonabeau, 2009; Simula & Vuori, 2012 |

**Table 4: Governance of Internal Crowdsourcing**

In summary, the above discussion shows important differences between governance of internal crowdsourcing and external crowdsourcing and hierarchy-based work. Hierarchy-based work does not require a culture that is open to innovative forms or work. External crowdsourcing requires a culture open to external contributions (it would suffer from a "not-invented-here syndrome"). Internal crowdsourcing lies in between, requiring a culture that is at least open to "boundary spanning" contributions within the enterprise (e.g., Denyer et al., 2011). Further, in contrast to external crowdsourcing, internal crowdsourcing requires the careful management of on-going relationships between the enterprise and the crowd

(employment contract) and the solvers and requestors (who may be from different areas and hierarchy levels) (e.g., Prpic et al., 2015). The design of incentives (including monetary rewards) for internal and external crowdsourcing (e.g. Lopez et al., 2010; Simula & Vuori, 2012) is different from hierarchy-based work (e.g., it is not usual that one's salary is decided by crowd vote in hierarchy-based work). In internal crowdsourcing (in contrast to external crowdsourcing), existing relationships in the hierarchical organisation, corporate culture (Benbya & Van Alstyne, 2010), and the regular workload of employees have to be considered (Hasan et al., 2009). Furthermore, internal crowds are employees and hence professionals with respect to what the organisation specifically does, embedded in enterprise hierarchies, and involved in the day-to-day business (all of which does not typically the case in external crowdsourcing). Hence, culture and change management skills are required from initiators of internal crowdsourcing. On the other hand, setting regulations and legal framework (e.g., "terms and conditions" of participation) is easier in internal crowdsourcing as existing employment contracts, non-disclosure agreements, and similar legal measures are in place in the internal context (as in hierarchy-based work with employees).

## 4.3. People Involved in Internal Crowdsourcing

People typically fall into two roles in internal crowdsourcing: requestors (organisers, crowdsourcer) and solvers (workers, crowdsourcee) (e.g., Zogaj & Bretschneider, 2014; Vukovic, 2009). External crowdsourcing may also involve a crowdsourcing intermediary and their staff (e.g., Schlagwein & Bjørn-Andersen, 2014; Kuppuswamy & Bayus, 2014). This third role is not typically found in internal crowdsourcing (i.e., there may be third-party technology, but no intermediary staff permanently involved).

The **requestors** typically come from upper- or top management (e.g., Benbya, & Van Alstyne, 2010) and use internal crowdsourcing to achieve specific enterprise goals (Geiger et al., 2011). Requestors are responsible for organising and managing the crowdsourcing process, whether they directly perform the tasks or engage associates to act as their agents. As above, requestors will define the crowdsourcing parameters, generate awareness, allocate resources, coordinate validating and ensure payment (Vukovic & Naik, 2011; Skopik et al., 2012; Vukovic, 2009, Lopez et al., 2010; Erickson et al., 2012a; Vukovic, 2009). Requestors should be proactive in their management but should be open (i.e., allow solvers to have a substantial impact on decisions) and transparent in their decision-making (Erickson et al., 2012b).

The **solvers** in internal crowdsourcing are employees, bound by contracts and reporting relationships (Simula & Ahola, 2014). Large and multinational enterprises in particular have a substantial, diverse range of (possible) solvers (Simula & Ahola, 2014); providing the diversity that is critical for successful internal crowdsourcing (Stieger et al., 2012). Successful solvers are self-organised and non-conformist (Stieger et al., 2012). The congruence of aims of solvers and requestors is typically high in internal crowdsourcing because they are in the same enterprise (Simula & Ahola, 2014). As above, solvers in internal crowdsourcing typically have domain expertise and problem-solving knowledge that, in relation to the needs of the enterprise, is superior to external crowds (Erickson, 2012). However, this expertise and their professional mental maps may also prevent internal crowds from proposing the "outside-the-box" solutions that might be achieved with external crowdsourcing (see further Afuah & Tucci, 2012, Schlagwein & Bjørn-Andersen, 2014). Creative and proactive solvers are the most important for internal crowdsourcing (Zhu et al., 2014). Further, while a common socio-cultural background of solvers may increase engagement and hence be positive for internal crowdsourcing (Riemer & Scifleet, 2012), conformity and social pressures have a negative effect on internal crowdsourcing (Stieger et al., 2012). The motivation and commitment level of solvers in internal crowdsourcing varies significantly (especially because internal crowds do not self-select to engage in crowdsourcing to the same extent as external crowds) (Simula & Ahola, 2014) and solvers can become discouraged if their efforts are not appropriately acknowledged and rewarded (Zogaj & Bretschneider, 2014).

Table 5 summarises findings on the people involved in internal crowdsourcing.

|  | **Findings: Internal Crowdsourcing…** | **Recommended Sources** |
|---|---|---|
| **Requestors** | ▪ Should involve open, transparent decision-making by requestors (e.g., Erickson et al., 2012a)<br>▪ Needs leaders and sponsor that breaking through enterprise structures and processes that may act as barriers (e.g., Erickson et al., 2012a) | Benbya, & Van Alstyne., 2010; Geiger et al., 2011; Lopez et al., 2010; Erickson et al., 2012a; Vukovic, 2009; Vukovic & Naik, 2011 |
| **Solvers** | ▪ Benefits from congruence (shared interest) of solver and requestor (e.g., Simula & Ahola, 2014)<br>▪ Needs diverse (e.g., Simula & Ahola, 2014), creative, and proactive (e.g., Zhu et al., 2014), and self-organised and non-conformist (e.g., Stieger et al., 2012) solvers<br>▪ Needs a reward structure appropriate to solvers (e.g., Zogaj & Bretschneider, 2014)<br>Must consider that employees' motivations and | Bretschneider & Zogaj, 2014; Erickson 2012; Lopez et al., 2010; Riemer & Scifleet, 2012; Simula & Ahola, 2014; Stieger et al., 2012; Vukovic, 2009; Zhu et al., 2014 |

| commitment levels vary significantly (e.g., Simula & Ahola, 2014) | |

**Table 5: People Involved in Internal Crowdsourcing**

When compared to general crowdsourcing and hierarchy-based work, requestors and solvers of internal crowdsourcing campaigns have unique characteristics. In internal crowdsourcing, requestors and solvers at the same time part of an organisational hierarchy (e.g., requestors might be superiors) (e.g., Benbya, & Van Alstyne, 2010). By definition, solvers in external crowdsourcing are not part of the enterprise hierarchy. Further, internal solvers typically have domain-specific backgrounds and expert knowledge (Erickson, 2012) as well as a high congruence with the requestors' goals (Simula & Ahola, 2014). This is not typically the case with external crowdsourcing. Internal crowds show different levels of motivation and commitment than external crowds, with external crowds self-selecting to participate in crowdsourcing. That is, while internal crowdsourcing contrasts with hierarchy-based work (part of the regular job profile/description) in being "open" (voluntary participation), there may be expectations to participate or employees might see participation as a strategic action (e.g., for promotion). In internal crowdsourcing, the range of solvers (e.g., in terms heterogeneous) is more limited. External crowdsourcing is particular suitable of "outside-of-the-box" solutions (see further Afuah & Tucci, 2012, Schlagwein & Bjørn-Andersen, 2014). Finally, third-party intermediaries can play a central role in external crowdsourcing, while they are usually absent in internal crowdsourcing.

## 4.4. Role of IT for Internal Crowdsourcing

The **IT** component of the framework refers to the information systems, technologies or platforms used to facilitate internal crowdsourcing processes. In contrast to other forms of work, IT takes on a qualitatively different enabling and shaping role for crowdsourcing (Majchrzak & Malhotra 2013). Based on the reports in the literature on the type of IT used, we can group IT that enables internal crowdsourcing into two groups: generic social IT platforms (i.e., multi-purpose tools such as social networking sites or wikis), and specific crowdsourcing IT platforms (i.e., tools developed specifically for crowdsourcing, possibly even for a particular purpose in a particular enterprise).

**Generic social IT platforms** (enterprise social software) can provide the basic means to enable forms of internal crowdsourcing (Riemer & Scifleet, 2012; Holtzblatt et al., 2012). Social platform tools generally transform companies' innovation processes (Raman &

McAfee, 2009, Rohrbeck et al., 2015, see also call for papers of this special issue). For example, wikis are one popular example of a generic social IT platform (Andriole, 2010; Stocker et al., 2012; Patten & Keane, 2010). Used for internal crowdsourcing, wikis foster innovation processes by collecting ideas and feedback (Standing & Kiniti, 2011), allowing for collaborative writing (Andriole 2010) and enabling new ways of learning (Milovanović et al., 2012). Other IT forms are equally suitable for internal crowdsourcing. For example, Majchrzak et al. (2009) documented an intranet forum being used for collaborative suggestions and the evaluation of ideas. There are various other standard tools, such as Yammer (a common internal microblogging tool), that are also suitable for internal crowdsourcing processes. However, using generic social IT tools and platforms for internal crowdsourcing can be challenging as existing security guidelines and regulations (e.g., privacy, barrier-free access) may make repurposing such tools difficult (Rohrbeck et al., 2015).

**Specific crowdsourcing IT platforms** facilitate repeatable and well-defined crowdsourcing processes that feature the same fixed characteristics (Geiger et al., 2011). For example, idea management systems are built to gather, organise, select and manage the innovative ideas provided by the crowdsourcing communities (Bailey & Horvitz, 2010; Abu El-Ella et al., 2013; Westerski et al., 2011; Rohrbeck et al., 2015). Idea market platforms may use virtual stocks to represent new product ideas and allow solvers to suggest and trade new product ideas in a marketplace (Soukhoroukova, 2012). Other crowdsourcing platforms have been described as "online idea contest platforms" (Bjelland & Wood, 2008), "internal knowledge markets" (Benbya & Van Alstyne 2010), "ideation platforms" (Erickson et al., 2012a) or "crowdfunding platforms" (Muller et al., 2013). What is common about these platforms is that they typically are specific to one particular problem category addressed with crowdsourcing (intelligence, design, decision) and sometimes even specific to the enterprise's very particular needs. Microsoft, IBM, Whirlpool, Starbucks and Dell are among major enterprises that have been documented as using specific crowdsourcing platforms (e.g., Bailey & Horvitz, 2010; Di Gangi & Wasko, 2009). Specific crowdsourcing platforms can be better integrated in automated workflows and existing business processes to further enhance the effectiveness of internal crowdsourcing (Rohrbeck et al., 2015). Such improved integration may reduce barriers for employees to participate in internal crowdsourcing (e.g., single-sign-on [SSO] can be used) (Rohrbeck et al., 2015).

Table 5 summarises the findings on the role of IT for internal crowdsourcing.

| | Findings: Internal Crowdsourcing… | Recommended Sources |
|---|---|---|
| **Generic social IT platforms** | • Is most effective if integrated into existing IT structures and processes (which will typically require specific IT) (Rohrbeck et al., 2015)<br>• Can be enacted with standard social IT such as wikis (e.g., Standing & Kiniti, 2011) or forums (e.g., Majchrzak et al., 2009) | Andriole, 2010; Hasan et al., 2009; Holtzblatt et al., 2012; Kane, 2014; Levy, 2009; Lin & Ehrlich 2012; Majchrzak et al., 2009; Milovanović et al., 2012; Razmerita al., 2014; Riemer & Scifleet, 2012; Schneckenberg 2009; Seo & Rietsema 2010; Rohrbeck et al., 2015; Standing & Kiniti, 2011; Stocker et al., 2012 |
| **Specific crowdsourcing platforms** | • Referred to as "idea management systems" (e.g., Bailey & Horvitz, 2010), "idea markets" (Soukhoroukova, 2012), "knowledge markets" (Benbya & Van Alstyne, 2010) or "crowdfunding platforms" (Muller et al., 2013)<br>• Benefits from lower entry barriers when integrated with internal IT (e.g., SSO) on user side (Rohrbeck et al., 2015)<br>• Can be integrated with tools, workflows, and (semi-) automated processes (Rohrbeck et al., 2015) | Abu El-Ella et al., 2013; Bailey & Horvitz, 2010; Benbya & Van Alstyne, 2010; Bjelland & Wood, 2008; Erickson et al., 2012a; Geiger et al., 2011; Jette at al., 2015; Laredo et al., 2012, Lopez et al., 2010; Muller et al., 2013; Soukhoroukova, 2012; Rohrbeck et al., 2015; Stieger et al., 2012; Vukovic, 2009; Vukovic et al., 2013; Vukovic & Naik, 2011; Vukovic & Natarajan 2013a; 2013b; Vukovic & Stewart 2012; Westerski et al., 2011 |

**Table 5: Role of IT for Internal Crowdsourcing**

Summarising the above, IT plays an enabling and shaping role for internal crowdsourcing and crowdsourcing in general. Crowdsourcing work models are necessarily enabled by IT (necessary condition), while IT is not a necessary condition for many forms of hierarchy-based work, and the hierarchy-based model as such. Specific IT platforms for internal crowdsourcing can be integrated with the other internal IT (cf. Bjelland & Wood, 2008; Benbya & Van Alstyne 2010; Erickson et al., 2012a; Muller et al., 2013) so to reduce entry barriers for employees and increase automated use of results (Rohrbeck et al., 2015) (this is not typically the case for external crowdsourcing, esp. if hosted on third-party platforms).

## 4.5. The Process of Internal Crowdsourcing

Internal crowdsourcing is a process (models of which have been suggested in, for example, Vukovic, 2009; Geiger et al., 2011; Pedersen et al., 2013). Based on the findings and

conceptualisation reported in the set of papers we reviewed, we consider a typical internal crowdsourcing process to comprise 1) preparation, 2) execution, 3) evaluation/aggregation and 4) resolution. This is a process model of internal crowdsourcing (a timely order of phases) within our broader conceptual framework.

The first step is the **preparation** of the crowdsourcing process. In this step, a requestor or requestors need to decompose a business-relevant task into "crowdsourceable" tasks. The step also includes setting the parameters of the crowdsourcing, such as task descriptions, requirements, expected outcomes/acceptance criteria, duration/expiration, diverse quality parameters and rewards/incentives (Lopez et al., 2010; Vukovic, 2009). Such crowdsourcing tasks can be created periodically using the same process design and the same crowd (Lopez et al., 2010).

Several different process designs have been documented and can be chosen for a new internal crowdsourcing initiative in the preparation phase. Boudreau & Lakhani (2013) and Prpic et al. (2015) suggest there are "independent" process designs (i.e., the solvers compete and do not see the others' contributions) and "collaborative" process designs (i.e., the solvers work together and see each others' contributions) in internal crowdsourcing. Various hybrid forms are also possible (Geiger et al., 2011): for example, contributions could be viewed but not edited by other solvers. A preselection of internal crowdsourcing solvers may be useful, and can be done based either on solver qualifications, context requirements or both (Geiger et al., 2011; Prpic et al., 2015). Particular methods and skills (of requestors/organisers) are essential both for decomposing a work task into crowdsourceable tasks and for aggregating and integrating outcomes (Olsen & Carmel, 2013; Skopik et al., 2012).

The second step is the **execution** of the creative phase of the internal crowdsourcing process: an open call is issued and solvers make contributions in response. The "open call" is considered to be a core element of what makes "crowdsourcing" a unique way of working (Howe 2006; Lopez et al., 2010). Part of an open call should be clear, key information such as the nature of the task, the estimated time required and potential rewards (Vukovic et al., 2012). The execution of the core crowdsourcing process can be considered completed once solvers submit their ideas, contributions and solutions (Chiu et al., 2014). The length of time of internal crowdsourcing initiatives varies widely, but often they have a certain timeframe and are not "open-ended". For example, IBM gives solvers

72 hours in its idea jams to propose and revise new product ideas (Bjelland & Wood, 2008). These 72 hours constitutes the execution phase at IBM.

The third step is the **evaluation and aggregation** of the results of the core internal crowdsourcing process. Decomposed work and tasks eventually need to be aggregated and reintegrated (Olsen & Carmel, 2013; Skopik et al., 2012). The ability to aggregate crowdsourcing results is a critical success factor for internal crowdsourcing (Stieger et al., 2012). Geiger et al. (2011) suggest that aggregation can be performed by "integration", in which all contributions meeting a certain quality requirement are used, or by "selection", in which contributions are compared and the best are selected. When the results of internal crowdsourcing are numeric, aggregation can be done by averaging, thus leveraging "collective intelligence" (Bonabeau, 2009; Malone et al., 2009; Stieger et al., 2012). Evaluations could be based on predefined criteria and requirements, the requestors' judgment or the crowd's judgment (Chiu et al., 2014).

The fourth and final step is the **resolution** of the internal crowdsourcing process. In this step, solvers receive what they were promised (money, recognition etc.) for successfully executing the crowdsourcing task (Geiger et al., 2011). Naturally, this step can be taken only after evaluation is completed (Lopez et al., 2010). The promised reward is given to the appropriate solver(s). As above, the type of reward varies among crowdsourcing implementations. In some cases, solvers receive a fixed reward, regardless of the value of their contribution to the final outcome. In other cases, solvers receive success-based compensation, depending on the specific value of the solution. In still other cases, there is no monetary reward but only "fame" and recognition (Geiger et al., 2011) (e.g., announcing the solver as a "winner" on enterprise-internal channels). The outcomes of internal crowdsourcing are implemented in this phase as well.

Table 6 summarises the findings on the process of internal crowdsourcing

|  | **Findings: Internal Crowdsourcing…** | **Recommended Sources** |
|---|---|---|
| **Preparation** | ▪ Can be designed in different structures (such as collaborative, competitive, networked) (e.g., Boudreau & Lakhani, 2013)<br>▪ Needs basic parameters to be defined upfront (e.g., Lopez et al., 2010)<br>▪ Needs payments and reward (one of the most important parameters) to be defined upfront (e.g., Bretschneider & Zogaj, 2014) | Boudreau & Lakhani, 2013; Bjelland & Wood, 2008; Bretschneider & Zogaj, 2014; Chiu et al., 2014; Erickson 2012; Geiger et al., 2011; Lopez et al., 2010; Majchrzak & Malhotra, 2013; Malone et al., 2009; Olsen & |

| | | |
|---|---|---|
| | ▪ Can be based on preselection of solvers based on qualifications or particular skills (e.g., Geiger et al., 2011)<br>▪ Need tasks that are appropriately decomposed, but producing outcomes that can be (re-)integrated (e.g., Olsen & Carmel, 2013) | Carmel, 2013; Prpic et al., 2015; Simula & Ahola, 2014; Skopik et al., 2012; Vukovic, 2009; Vukovic, et al., 2012; Vukovic & Natarajan 2013a; 2013b |
| **Execution** | ▪ Is advertised effectively through an open call (e.g., Lopez et al., 2010)<br>▪ Should be communicated with timeframe and reward in the open call (e.g., Vukovic et al., 2012) | Bjelland & Wood, 2008; Chiu et al., 2014; Lopez et al., 2010; Vukovic et al., 2012; 2013 |
| **Evaluation / aggregation** | ▪ Must be evaluated according to a regime that has been set upfront, evaluation approach should not be changed (e.g., Chiu et al., 2014)<br>▪ Typically involves the crowd for evaluation (e.g., Chiu et al., 2014)<br>▪ Requires the ability to (re-)aggregate crowdsourcing outcomes (e.g., Stieger et al., 2012)<br>▪ Can be based on "integration" or "selection" modes in the evaluation/aggregation phase (e.g., Geiger et al. 2011) | Bonabeau, 2009; Chiu et al., 2014; Geiger et al., 2011; Malone et al., 2009; Olsen & Carmel, 2013; Skopik et al., 2012; Stieger et al., 2012 |
| **Resolution** | ▪ May need rewards to be distributed according to fixed or flexible models (e.g., Geiger et al., 2011) | Bailey & Horvitz, 2010; Benbya & Van Alstyne, 2010; Gaspoz, 2011; Geiger et al., 2011; Lopez et al., 2010; Malone et al., 2009; Vukovic, 2009 |

**Table 6: The Process of Internal Crowdsourcing**

In summary, internal and general crowdsourcing follow a similar process. In contrast to hierarchy-based work, internal crowdsourcing initiatives are usually not "open-ended" and initiated with an "open call" through which all (or a selection of) employees are invited to participate on a voluntarily basis for the duration of the initiative (Howe 2006; Lopez et al., 2010). Further, certain types of internal crowdsourcing designs allow solvers to participate in the evaluation and aggregation of the results (e.g. Chiu et al., 2014). In hierarchy-based work, executives typically perform this task. This can affect the resolution phase of a crowdsourcing initiative. If solvers receive (monetary) rewards according to a crowd-based evaluation, then compensation is directly determined by fellow employees (peers). In hierarchy-based work, monetary compensation, if flexible at all, is typically established by superiors, not peers.

### 4.6. Outcomes of Internal Crowdsourcing

"Outcomes" refers to the ultimate manifest results of internal crowdsourcing (after completion of the process). The outcomes will typically correspond to the original problem

addressed. Based on all findings and statements in the set of papers we reviewed, three outcome types can be expected of internal crowdsourcing: integration, innovation and choice.

**Integration** refers to capturing and integrating already existing enterprise knowledge. Here, internal crowdsourcing is used to distribute existing information and knowledge within the enterprise (Simula & Vuori, 2012). This includes the consolidation of corporate terminology, which is beneficial for organisational learning (Rohrbeck et al., 2015). The outcome is not new knowledge as such, but a new combination of existing pieces by transferring internal knowledge, promoting learning and integrating distributed functions, departments, and locations within the enterprise (Guy et al., 2015; Simula & Vuori, 2012; Stocker et al., 2012; Vukovic et al., 2012). The crowd may be able to answer tough questions accurately and quickly based on existing knowledge the requestor does not have (McAfee, 2009).

**Innovation** is the creation of genuinely new knowledge (e.g., the basis for an innovative product or service). Innovation can be of a tangible and intangible nature; the latter is inherently difficult to measure (Erickson et al., 2012b). Innovation outcomes from internal crowdsourcing are likely as ideas are exposed to wider audiences (Bjelland & Wood, 2008) and more diverse solvers participate (Soukhoroukova, 2012; Muller et al., 2013; Simula & Vuori, 2012) (compared to hierarchy-based work). When every employee is able to participate, serendipity increases (Simula & Ahola, 2014). Internal crowdsourcing supports the development of new products and services (Soukhoroukova, 2012) but also the rejuvenation of existing products and processes (Simula & Vuori, 2012). The creation of new business units to enact such innovations may then be an outcome of internal crowdsourcing (Standing & Kiniti, 2011; Bjelland & Wood, 2008). The difference between innovation and integration is fluid and depends on the degree of creativity and novelty of the outcome.

**Choices** can also be the outcome of selection problems. A choice can be an outcome of a crowd voting process (Schneider et al., 2012; Prpic et al., 2015) or the "voting" through a crowdfunding initiative (Muller et al., 2013). Outcomes from prediction markets may provide choices; they leverage information, knowledge and options scattered throughout the enterprise to make better choice on R&D projects (Gaspoz, 2011) or marketing campaigns (Prpic et al., 2015).

Outcomes of one internal crowdsourcing initiative may be the inputs (issue) of a following internal crowdsourcing initiative. For example, if several potential innovations are developed, a decision problem may arise that can again be addressed by the crowd (e.g., Chiu et al., 2014). Certainly, the enterprise learns from any internal crowdsourcing initiatives for future internal crowdsourcing initiatives.

Table 7:7 summarises the findings on the outcomes of internal crowdsourcing.

| | Findings: Internal Crowdsourcing… | Recommended Sources |
|---|---|---|
| **Integration** | ▪ Increases collaboration across internal boundaries (e.g., Simula & Vuori, 2012)<br>▪ Improves knowledge exchange in the organisation (e.g., Vukovic et al., 2012)<br>▪ Facilitates internal organisational learning (e.g., Rohrbeck et al., 2015)<br>▪ Is a fast problem-solution or question-answer model (e.g., McAfee, 2009) | Gaspoz, 2011; Guy et al., 2015; Laredo et al., 2012; McAfee, 2006; 2009; Patten & Keane, 2010; Rohrbeck et al., 2015; Schlagwein et al., 2011; Simula & Vuori, 2012; Stocker et al., 2012; Vukovic et al., 2012 |
| **Innovation** | ▪ Fosters involvement in innovation across internal boundaries (e.g., Muller et al., 2013)<br>▪ Supports translating ideas into innovation (including new business units) (e.g., Standing & Kiniti, 2011)<br>▪ Provides intangible positive outcomes from working on innovation (such as employee job satisfaction) (e.g., Erickson et al., 2012a)<br>▪ Allows solvers to articulate their innovation ideas to wide audiences (e.g., Bjelland & Wood, 2008)<br>▪ May result in new products (e.g., Soukhoroukova, 2012), commercialisation of new technologies (e.g., Bjelland & Wood, 2008), or improvement to existing products and processes (e.g., Simula & Vuori, 2012) | Bjelland & Wood, 2008; Erickson et al., 2012a; 2012b; Leung, et al., 2014; Muller et al., 2013; Simula & Ahola, 2014; Simula & Vuori, 2012; Soukhoroukova, 2012; Standing & Kiniti, 2011 |
| **Choice** | ▪ Is able to produce effective decisions on matters such as R&D investments (e.g., Gaspoz, 2011) or marketing campaigns (e.g., Prpic et al., 2015)<br>▪ Is able to make useful predictions (e.g., Prpic et al., 2015) | Gaspoz, 2011; Prpic et al., 2015 |

**Table 7: Outcomes of Internal Crowdsourcing**

There are different characteristics for the outcomes of internal crowdsourcing compared to external crowdsourcing and hierarchy-based work. In contrast to external crowdsourcing, the outcomes of internal crowdsourcing may correspond to problems that could not be solved with external crowds (e.g., the enterprise may not wish the public to know the problem, the outcome/solution, or both) (e.g., Simula & Vuori, 2012). As already discussed above, the nature of the outcome may also be different based on the typically more expert knowledge of employees vis-à-vis the more distributed knowledge of end users

(Schlagwein & Bjoern-Andersen 2014). In contrast to hierarchy-based work, internal crowdsourcing, as a work model, is better capable of overcoming boundaries (e.g., departmental boundaries) and hierarchies within an enterprise (Guy et al., 2015; Simula & Vuori, 2012; Stocker et al., 2012; Vukovic et al., 2012). This is so primarily because internal crowdsourcing allows for the exposure of innovative ideas to wider audiences compared to such exposure in hierarchy-based work organisation (Bjelland & Wood, 2008). In addition to the immediate value of having cross-fertilisation of ideas, internal crowdsourcing may also improve integration, employee satisfaction and loyalty more long-term and generally (e.g., Erickson et al., 2012a, Muller et al. 2013).

## 4.7. What Is Different About Internal Crowdsourcing?

In addition to reviewing and synthesising the knowledge and insights in the literature on internal crowdsourcing, the framework used in this paper also helps a structured comparison between internal crowdsourcing, external crowdsourcing and internal hierarchy-based work.

Table 8 summarises these differences between the three work models, as discussed above (in the respective closing paragraph of each subsection). Knowledge on internal crowdsourcing (central column) is provided in analysis above. We also refer to sources summarising such knowledge on external crowdsourcing (e.g., Pedersen et al. 2013) and hierarchy-based work (e.g., Stone 2005).

| | External Crowdsourcing | Internal Crowdsourcing | Hierarchy-Based Work |
|---|---|---|---|
| **Problems** (subsection 4.1) | ▪ Suitable for problems benefitting from knowledge varied across the total "landscape".<br>▪ Can*not* address problems that include mission-critical, highly contextual/expert and otherwise non-publishable problems | ▪ Suitable for problems benefitting from knowledge varied across departments.<br>▪ Can address problems that include mission-critical, highly contextual/expert and otherwise non-publishable problems. | ▪ Suitable for problems for which the best solvers are assumed to hold the respective position.<br>▪ Can address problems that include mission-critical, highly contextual/expert and otherwise non-publishable problems. |
| **Governance** (Discussed in subsection 4.2) | ▪ Community engineering and management important<br>▪ Immediate incentivisation needed (e.g., one-off payment) | ▪ Culture and change management important<br>▪ Mix of immediate and long-term incentivisation needed<br>▪ Intellectual property | ▪ Traditional governance<br>▪ Long-term incentivisation needed<br>▪ Intellectual property rights not a central concern |

| | | | |
|---|---|---|---|
| | ▪ Intellectual property rights a central concern | rights not a central concern | |
| **People** (Discussed in subsection 4.3) | ▪ Solvers are volunteering externals<br>▪ Requestors and solvers in no organisational relationship<br>▪ Typically involves third-party crowdsourcing intermediary staff | ▪ Solvers are volunteering employees<br>▪ Requestors and solvers are in some organisational relationship<br>▪ Typically does not involve third-party crowdsourcing intermediary staff | ▪ "Solvers" are designated employees<br>▪ "Requestors" and "solvers" are in direct organisational relationship (reporting structure)<br>▪ No crowdsourcing intermediary |
| **IT** (Discussed in subsection 4.4) | ▪ IT is a "shaper" (model not possible without IT)<br>▪ Crowdsourcing platform typically specific to type of problem, not specific to one enterprise | ▪ IT is as "shaper"<br>▪ Crowdsourcing platform typically specific to type of problem and often the focal enterprise, allowing deeper IT integration (such as SSO) | ▪ IT may be a support (model typically possible without IT) |
| **Process** (Discussed in subsection 4.5) | ▪ Participation based on open call to externals<br>▪ Short-term oriented process (not open ended)<br>▪ Evaluation performed by external crowd (at least in first instance) | ▪ Participation based on open call to employees<br>▪ Short-term oriented process, but with link to long-term structures (e.g., promotion)<br>▪ Evaluation performed by peer/employee crowd (at least in first instance) | ▪ On-going continuous work process<br>▪ Long-term oriented process (in employment; less so in projects)<br>▪ Evaluation performed by responsible manager |
| **Outcomes** (Discussed in subsection 4.6) | ▪ "Outside-the-box", entrepreneurial solutions<br>▪ Requires acceptance of external solutions<br>▪ No organisational boundaries to overcome | ▪ Wider array of expert/context based solutions<br>▪ Does not requires acceptance of external solutions, but of solutions from other departments<br>▪ Boundary spanning (as side effect) not encouraged and supported by model | ▪ Narrow array of expert/context based solutions<br>▪ No acceptance of outside solutions needed<br>▪ Boundary spanning not specifically encouraged or supported by model |

**Table 8: Differences between External Crowdsourcing, Internal Crowdsourcing and Hierarchy-Based Work Models**

In summary, in contrast to external crowdsourcing, internal crowdsourcing is more long-term oriented with "the crowd" consists of permanent employees, not independent externals. This implication for the governance of internal crowdsourcing in that culture and change management become important (esp. in the beginning), as do long-term

incentivisation (e.g., counting crowdsourcing contribution for promotion), while the is less governance of the legal framing required (due to employment contracts being in place). Internal crowdsourcing is an effective model to integrate internal knowledge distributed across the organisation. External crowdsourcing has more potential to reveal "outside-the-box" solutions resulting from "distant" knowledge (see further Afuah & Tucci 2012, Jeppesen & Lakhani 2010, Schlagwein & Bjoern-Andersen 2014).

In comparison to internal hierarchy-based work, internal crowdsourcing is different in its treatment of departmental boundaries and formal roles. Employees can work on internal crowdsourcing initiatives regardless of their formal position. The benefits are that solution can be based on the distributed and diverse knowledge (including tacit knowledge) that the organisation already has – just in the mind of the right person. It makes more effective tasks and problem solving that benefits from access to internal knowledge and experiences from different domains; it is not appropriate for tasks that are assumed to already be in the hands of the responsible employee as the best "solver" (which is the case for most enterprise tasks). Internal crowdsourcing is a more open and democratic work model (in terms of rewards, transparency, decision-making, etc.) then hierarchy-based work. Even if participation is voluntary, however, any work in internal crowdsourcing causes additional workload for employees, which has to be considered appropriately (e.g., Hasan et al., 2009).

## 5.    Research Agenda and Outlook

The review above provides a clear definition and conceptualisation of the novel phenomenon internal crowdsourcing and a comprehensive overview of research findings and insights relevant for internal crowdsourcing to date. In this section, based on a discussion of particular aspects of our above analysis, also informed by our experience with internal crowdsourcing in practice, we briefly outline an agenda for future research on internal crowdsourcing.

We found that internal crowdsourcing can be used to solve several types of problems (i.e., intelligence, design, choice). To address such problems effectively, several major design and governance parameters (i.e., criteria, duration, rewards, etc.) have to be set. Research informing such design decisions will be useful as it helps organisers and requestors with better design of internal crowdsourcing. While these parameters have received some

attention (Lopez et al., 2010; Vukovic, 2009), we do not know much about their relative importance, interactions, and appropriateness in different contexts. We found in the review that many models inherently seem to assume a context-free, "single truth" phenomenon, which seems reductionist and unrealistic. For future research, rather than ignoring context, it would be useful to analyse the relationships between the characteristics of internal crowdsourcing initiatives and their particular context. That is, which type and design of internal crowdsourcing and which parameter are most suitable for particular situations? We agree with Pedersen et al. (2013) that the contextual features that enhance or inhibit the use of (internal) crowdsourcing are not well understood.

Furthermore, several of the above governance tasks performed in internal crowdsourcing are not sufficiently understood. For example, we lack knowledge, theories and frameworks to answer basic questions such as what qualifications (if any) an enterprise should require of solvers or how long an internal crowdsourcing initiative should last. Zogaj and Bretschneider (2014) point out that the critical point of maintaining crowd interest over time almost necessarily requires longitudinal accounts of crowdsourcing, which we lack. Task decomposition and work delineation is a key challenge in internal crowdsourcing that only few studies have addressed (Olsen & Carmel, 2013; Skopik et al., 2012). We do not know much about how firms create, or should create, internal crowdsourcing tasks. Future research needs to examine how enterprises go about, or could go about, breaking down work to make it "crowdsourceable". Understanding task decomposition better then will also help us to understand what type of work can be crowdsourced (solved in a crowdsourced work model) in its nature.

Incentives and motivations in internal crowdsourcing have been a specific focus in research (e.g., Kügler et al., 2013; Lopez et al., 2010; Simula & Vuori, 2012). This may be due to the ease of data access (e.g., survey data) and the clear level of analysis (individuals) of such investigations. However, despite substantial research, no general model has been agreed upon regarding what motivates solvers in internal crowdsourcing. The contradictory conclusions regarding the effectiveness of monetary incentives (Bailey & Horvitz, 2010; Benbya & Van Alstyne, 2010; El-Ella et al., 2013; Soukhoroukova, 2012) suggest the need for a deeper investigation of the relationship between, for example, different purposes of internal crowdsourcing and solvers' motivation. As above, this disagreement seems to indicate that the context of each internal crowdsourcing initiative is unique and thus resists simple generalisation. That is, a particular reward type might be effective only for internal

crowdsourcing initiatives with a particular type of purpose. Take, for example, an initiative to develop a marketing campaign for a paying client vis-à-vis a crowdsourcing initiative to make the enterprise green and carbon-neutral. One might assume that different people with different motivations would engage in these two initiatives, that the atmosphere of competition versus collaboration might be different, and so on. However, while such assumptions regarding internal crowdsourcing seem reasonable, they are not based on research. More research will be needed to better understand the relation between effective incentives, motivation and the purpose and context of internal crowdsourcing.

People and their roles in internal crowdsourcing also require further research. While basic types of participants have been described above, we do not know which type of manager pushes for internal crowdsourcing or which type of employee is eager to participate – which would be useful to know, for example, to identify early adopters so to build a critical mass of participants. Related to this, research should also explore further how one can put an effective crowd together. Some researchers suggest that heterogeneity of solvers may be useful (Stieger et al., 2012), while others find that homogeneity works best (Riemer & Scifleet, 2012). Also, the size of the crowd could be an important factor (Chiu et al., 2014), as could the relationship between attributes at the individual level (e.g., personality) and organisation at system and group level (e.g., competition vs. collaboration structures). Understanding why an employee participates in which kind of crowd could greatly improve the implementation of internal crowdsourcing for the benefit of both the employee and the enterprise.

IT evidentially plays an enabling for crowdsourcing. However, little is known about the interaction and relation between people and IT for crowdsourcing. To understand better the uses and consequences of IT platforms for crowdsourcing, further research on the dynamic interactions between the employees, the enterprise, and the IT they use for internal crowdsourcing is necessary. Theories of technology affordance and constraints (a theory seeking to understand the action potential of IT relative to a human/animal actor) might provide fruitful ground for future research in this direction (e.g., Volkoff & Strong 2013, Majchrzak & Markus 2013, Leonardi et al. 2013).

Another relevant but under-explored question is the measurement of "success", that is, the achievement the goals of internal crowdsourcing and its short-, mid-, and long-term impacts. Typically, long-term internal crowdsourcing goals (beyond the specific short-term

expectations of the crowdsourcing initiative) are defined vaguely at best. Naturally, Intangible long-term outcomes of internal crowdsourcing are difficult to assess (Erickson et al., 2012b. For example, does internal crowdsourcing affect the loyalty of employees or the performance of the enterprise? Again, while reasonable to assume, there is little or no research to make any such claims. Here, in-depth, longitudinal studies could shed light on the impact of internal crowdsourcing, including its less obvious and long-term impact on issues such as corporate climate and culture. Furthermore, we cannot presently define the boundaries of internal crowdsourcing, that is, how far the concept can make inroads into (replace or complement) hierarchy-based work. Based on a longitudinal study of LEGO, Schlagwein & Bjørn-Andersen (2014) suggest that hierarchy-based employee work and learning is best for "expert intuiting" (solving problems that require expertise and experience) and external crowdsourcing is best for "entrepreneurial intuiting" (connecting different, previously unconnected contexts). Is it that organisational learning theory is a useful theoretical framework for future internal crowdsourcing research?

Because we cannot, at present, answer the questions asked in this section, it is difficult to estimate how widespread a phenomenon internal crowdsourcing may become (see also Simula & Ahola, 2014). However, what is certainly evident is that internal crowdsourcing is a new and important IT-enabled phenomenon that requires more research (it has received much less attention than its more publicly visible sibling external crowdsourcing).

## 6.    Conclusion

To conclude, IT-enabled internal crowdsourcing has emerged as a phenomenon and has generated a first generation of research papers and studies. Internal crowdsourcing has unique characteristics that make it distinct from both from external crowdsourcing and hierarchy-based work. The purpose of this review is to provide a starting point for future research by providing definition of, a framework for, and a summary of what we know and do not know about internal crowdsourcing (on scope and purpose of literature reviews in IS, see Rowe 2014). We discuss the literature relevant for internal crowdsourcing (74 papers; an EndNote library with the full set of papers is available from the lead author) based on a six components framework (based on Pedersen et al. 2013) that allows us to analyse, summarise, and discuss the findings and insights in the literature and identify areas with conflicting findings or where research is missing outright. We hope that the

paper contributes to support future research on internal crowdsourcing by strengthening the integration of insights and providing conceptual foundations.

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