SILVERMAN
R E S E A R C H

Collective Intelligence in Organisations

Uses and Challenges

Executive Report

London, June 2015

This report provides an overview of Collective Intelligence in organisations. It brings together perspectives from different areas of study in what is a diverse and multi-disciplinary topic. First we look at Collective Intelligence in general terms – what it is, how it is defined, the impact of social and digital technologies and how organisations are using it to address a variety of business issues. Then we discuss the various challenges to overcome in designing and using Collective Intelligence tools in an organisational context.

The report centres on Collective Intelligence systems and tools that involve some form of discussion, ideation or interaction as well as interactive voting or rating mechanisms. This is because tools that possess these functions are reasonably common and also that they are often the most complex in terms of design, administration and analysis.

One issue that emerges quite strongly is that not all Collective Intelligence is created equally – there are levels of Collective Intelligence. Simple survey methodologies do provide Collective Intelligence of a sort, but what they lack is a social element that enables participants to evaluate each other's responses.

This is important because when this type of aggregation is provided it is possible to obtain *Social Collective Intelligence* - and that's quite a different proposition in terms of the richness of insight produced. If a group is interacting in a system that has been carefully designed to optimise their input and extract insight then the level of Collective Intelligence obtained can be far greater than any survey.

I hope the report is useful to people working in Market Research, Digital Social Innovation, Computer Science, Internal Communications or Human Resources. Thanks to Milly Picton for help with the report.

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Executive Summary

What is Collective Intelligence?

The Internet is giving rise to some remarkable technologies that enable large groups of people to collaborate online. This is having a huge impact in the field of Collective Intelligence as it provides an opportunity to progress research and practice in this area. There is a need to understand what's important in mass online interactions and discussions because intelligence doesn't just reside within us as individuals – it also emerges from groups of people. Collective Intelligence is a broad area and the term is often applied quite liberally to a variety of activities or systems.

In the last ten years there has been an explosion in both research and interest. The main reason for this burst of enthusiasm is the rapid advance of social and digital technologies in both business and in the public sphere. These changes reflect the rise of a new era for Collective Intelligence, one that is able to fully take advantage of both the increasing interconnectivity between people and also the increasing computing and storage capabilities of advanced information and communication technologies.

The rise of social technologies has facilitated the rise of Collective Intelligence because before this it was almost impossible for large and dispersed groups of people to organise themselves and interact. Today, people can participate within technological systems that are increasingly able to orchestrate the collection and analysis of human social activity. This is the frontier of *Social Collective Intelligence*: networks of people and computers acting together in intelligent ways.

The term *Crowdsourcing* is synonymous with Collective Intelligence and the two are often used interchangeably. Crowdsourcing can be defined in different ways, although it's frequently defined as *taking a task that is typically conducted by one person and outsourcing it to a large group of people*. Both Collective Intelligence and crowdsourcing involve groups acting together online, however, there are differences. Crowdsourcing can enable Collective Intelligence, although that is not always the case. Crowdsourcing is usually more of a process, the goal of which is to distribute workload from one to many. Collective Intelligence, on the other hand, can be better thought of as a goal. The focus is on the output.

Using Collective Intelligence

There are many areas of work and types of task to which Collective Intelligence methods can be applied. An area in which Collective Intelligence methods are commonly used is for generating ideas, discussions and solutions with networks of employees, customers and other external parties. Sometimes, there can be a competitive element or other incentives for participation.

In addition to allowing organisations to gather ideas and feedback from a greater number and diversity of people, Collective Intelligence approaches also help organisations to act on those insights by distributing work to people who are best placed to do it. This not only has the potential to enhance quality, but also to increase efficiency as tasks can be conducted in parallel by many people.

Collective Intelligence can also be used to predict the outcomes of future events. Aggregating the diverse perspectives, knowledge and experience of employees and customers can improve the accuracy of predictions.

Challenges for Collective Intelligence

Real-world implementations have taught us a great deal about some of the obstacles and pitfalls that need to be addressed in the development and use of Collective Intelligence tools. The challenges for Collective Intelligence come in a variety of forms, which can be roughly divided into four groups. These are challenges in Design, Social-Cognition, Administration and Leadership.

Researchers who are involved with the study of Human-Computer Interaction (HCI) and Collective Intelligence focus on *how* people and computers can be connected to enhance usability and output. The design choices made regarding the user interface of tools are extremely important. Potential participants will only get involved if the user interface guides them in a straightforward and meaningful way. Similarly, those interested in leveraging Collective Intelligence require a means by which to administrate, analyse and extract insights. Ultimately, Collective Intelligence requires the design of both technical infrastructure and human-human interaction – a socio-technical system.

It seems almost intuitive to us that a group will probably make a better decision than an individual and it's commonly thought that the performance of a group will be equivalent to that of its best members. While these assumptions seem obvious, however, there also needs to be acknowledgement that, under some circumstances, groups can make terrible decisions. Various social pressures and cognitive biases can affect the way people behave in a group. In certain circumstances this can be disastrous.

There are also administrative and operational hurdles to overcome in obtaining Collective Intelligence. Research has made a concerted effort to understand how best to grow and maintain active participation in online communities. Overcoming these challenges is crucial because human input is fundamental to Collective Intelligence – without enough fuel (and the right sort of fuel), the engine cannot run. Collective Intelligence in organisations poses some specific challenges for management and leadership because tapping into Collective Intelligence means taking a more open and transparent approach – and this requires significant cultural change.

Collective Intelligence is nothing new. Successful organisations have been encouraging collaboration and interaction since the first modern organisations were formalised. However, it is *Social Collective Intelligence*, resulting from the rapid development of social and digital technologies, that is both new and exciting in this area. Organisations are only just beginning to appreciate the potential that Collective Intelligence can offer. There are pockets of good practice appearing as organisations start to implement various Collective Intelligence activities. However, these early examples of Social Collective Intelligence are likely to be just the start of the story.

1. Introduction

The Internet has given rise to some remarkable technologies that enable people to collaborate en masse. In barely a decade, the biggest encyclopaedia in human history has been written by millions of authors with no centralised control. In under a year, ordinary people classified more than 50 million photos of distant worlds to help astronomers understand how galaxies are formed. All over the world, organisations are starting to open up social networks and collaborative environments from which emanate an endless stream of data and insight. The potential that lies within interconnected networks of computers and humans is only just starting to be realised.

1.1 What is Collective Intelligence?

We all possess intelligence, however, intelligence can be thought of not only as something that arises within human brains – it also arises in groups of people. This is *Collective Intelligence* – individuals acting together to combine their knowledge and insight. Collective Intelligence is an *emergent* property. It emerges from the group, it does not reside within any individual members.

Defining Collective Intelligence is troublesome because of the historical debate surrounding the definition of intelligence as a concept on its own right. This situation is exacerbated because the study of Collective Intelligence is not a well-defined area – the research literature provides a variety of definitions. This is, in a large part, due to the range of people who are interested in Collective Intelligence – it is a multi-disciplinary topic of study which has received attention from researchers in Psychology, Computer Science, Animal Behaviour, Human Computer Interaction, Crowdsourcing and Artificial Intelligence to name but a few. Despite their differences, what draws these disciplines together is a focus on creating or exploring tools, systems and platforms that give rise to Collective Intelligence.

1.2 The Emergence of Social Collective Intelligence

Although the term *Collective Intelligence* is thought to have materialised in the 1800s, the first academic references didn't appear until the 1970s. However, in the last 10 years there has been an explosion in both research and interest. The main reason for this burst of enthusiasm is the rapid advance of social and digital technologies in both business and in the public sphere.

Within organisations, openness and transparency are becoming vital business characteristics. Similarly, considering society at large, the subjects of Digital Social Innovation and Open Democracy are growing in prominence as they aim to capture how contemporary techno-social trends can be harnessed towards solving the most important challenges facing modern societies.

These changes reflect the rise of a new era for Collective Intelligence, one that is able to fully take advantage of both the increasing interconnectivity between people and also the increasing

computing and storage capabilities of advanced information and communication technologies. This is the frontier of *Social Collective Intelligence*: networks of people and computers acting together in intelligent ways.

The rise of social technologies has facilitated the rise of Collective Intelligence because before this it was almost impossible for large and dispersed groups of people to organise themselves and interact. Today, people can participate within technological systems that are increasingly able to orchestrate the collection and analysis of human activity. Real world interactions between humans are also subject to many social constraints, of which technology is helping to overcome. As a result, we are witnessing the creation of new and exciting ways of enhancing collaboration and generating Collective Intelligence.

The term *social machine has* also been used to describe Collective Intelligence systems and tools. It is helpful to think about Collective Intelligence emanating from social machines because it emphasises the joint involvement of both computers and the people using them as part of the machinery. The technology is the engine and the people are the fuel. When a particular social media platform (eg Twitter, Facebook or LinkedIn) is described as a social machine, it's the platform *and* the people who use it that constitute the social machine.

Social machines involve the participation of humans and technological components, with the expectation that each component will provide their distinctive capabilities to complement each other. For some social machines, it is humans that perform the clever or creative work and the machine that does the administration. However, the likelihood is that, in the future, the technology will increasingly take on more human tasks and will not be there just to organise human input.

1.3 The Wisdom of Crowds and Crowdsourcing

The *Wisdom of Crowds* is simply another term for Collective Intelligence. It stems from work the British scientist Sir Francis Galton. At a livestock exhibition in 1906, Galton observed a competition where people had to guess the weight of an ox. At the end of the contest, Galton gathered all the guesses and calculated the average number – this is essentially a simple survey methodology. The crowd's estimate turned out to be near perfect (the crowd's estimation was 1,197 pounds and the ox's actual weight was 1,198). Galton referred to this as the *collective wisdom of the crowd*: the fact that groups of people can be more intelligent than an intelligent individual and that groups do not always require intelligent people to reach a smart decision or outcome. Although, as we will see, the simplicity of asking people to guess a number bears little resemblance to the real-world complexity involved in, for example, analysing thousands of peer-evaluated comment threads in an online discussion.

The term *crowdsourcing* is synonymous with Collective Intelligence and the two are often used interchangeably. Crowdsourcing can be defined in different ways, although it's frequently defined as *taking a task that is typically conducted by one person and outsourcing it to a large group of people.* Both Collective Intelligence and crowdsourcing involve groups acting together online, however, there

are differences. Crowdsourcing can enable Collective Intelligence, although it doesn't always. Crowdsourcing is usually more of a process, the goal of which is to distribute workload from one to many. Collective Intelligence, on the other hand, can be better thought of as a goal. The focus is on the output.

Crowdsourcing can be categorised into three broad types: *Directed*, *Self-Directed* or *Passive*. In directed crowdsourcing activities, a requestor (the person or group running the exercise) directs the input of participants (crowd workers) by providing a specific brief or asking a particular question. There is usually is an external incentive for participation, which can either be social (eg recognition for coming top of the leader board) or financial (eg vouchers or money).

Self-directed crowdsourcing activities are characterised by the absence of a requestor, coupled with an intrinsic motivation for participation. This is where communities come together, of their own volition, to discuss various topics or decide on a specific course of action. On occasion, crowdsourcing can also be passive – this is where the output is a side effect of the work being done – the output is not an explicit objective of the participant. For example, in spam protection, reCAPTCHA is a simple tool found on many websites where people have to copy a simple code to prove they are human. Yet, this offers more than just spam protection, each one completed can help digitise text or annotate images even though the participant is not aware of this passive objective.

2. Using Collective Intelligence

There are many areas of work and types of task to which Collective Intelligence methods can be applied. These are outlined below, grouped according to the organisational challenges they address. There are a number of different ways in which various uses can be categorised or described – and there is also a great deal of overlap between uses. These methods are not mutually exclusive, the most appropriate approach may involve a combination of methods.

2.1 Ideation and Innovation

One of the areas in which Collective Intelligence methods have been most commonly used is for generating ideas and solutions for an infinite range of issues. Organisations are applying Collective Intelligence tools with networks of employees, customers and other external parties for a range uses within the area of ideation and innovation. For example:

Discussion and commentary

Many Collective Intelligence tools consist of virtual environments where participants can interact to discuss ideas and opinions or provide feedback on particular topics. Discussions can be on-going or fixed for a specific length of time. Typically, participants can make suggestions, receive feedback on their suggestions from other participants, as well as rate and comment upon the suggestions of others. As discussed later, community ratings and commentary on participants' suggestions can be analysed identify themes and comments that resonate most with the community.

Competitions and challenges

Here, people are invited to submit ideas, designs or solutions in response to a given brief. Participants (individuals or groups) then compete to provide a winning entry that is judged by the person or group that has initiated the competition (the requestor). In some instances, participants' offerings can also be evaluated and rated by other participants. However, there is typically no interaction between participants in the actual creation of the submission.

Collaborative design and insight communities

Unlike competitions and challenges, the focus of collaborative design is on participants working together to produce designs and solutions. Participants can evaluate each other's input and offer suggestions for improvement. Shared interests can also bring people together in a community to enhance knowledge, share best practice and propose new ideas. Various collaborative tools are often used to support insight communities by enabling social networking and discussion.

2.2 Knowledge Sharing and Workload Distribution

In addition to allowing organisations to gather ideas and feedback from a greater number and diversity of people, Collective Intelligence approaches also help organisations to act on those insights by distributing work to people who are best placed to do it. This not only has the potential to enhance quality, but also to increase efficiency as tasks can be conducted in parallel by many people at the same time. The main techniques are outlined below:

Parallel task processing

This is a feature of many Collective Intelligence tools whose approach is to reduce complex problems into simple tasks that can be worked on simultaneously by a large number of individuals. This approach works especially well for tasks that computers find extremely difficult to do. For example, labelling large numbers of uncatalogued photographs or categorising ambiguous photos of outer space. Task can be completed very quickly in this way.

Distributed questions and answer (Q&A)

This involves posting questions in a virtual forum that can be answered by other participants. Participants are then able to further elaborate and rate answers. Many organisations use distributed Q&A to reduce direct support costs and provide answers to common questions. For example, before providing contact details for support, an organisation will often direct customers to a community forum where they can see if other people have had a particular problem and what solutions there might be.

Games

Although good examples of this are uncommon, online simulations and games can allow participants to apply their knowledge and expertise to complex problems. One good example is Foldit, where the University of Washington used an online game to engage scientists in uncovering the structure of particular proteins. Using a protein-folding game called Foldit, thousands of scientists from a variety of educational backgrounds were able to solve a problem that eluded scientist for years.

2.3 Predicting the Future

Collective Intelligence can also be used to predict the outcomes of future events. Aggregating diverse perspectives, knowledge and experience of employees and customers can improve the accuracy of predictions. This allows organisations to make more informed, evidence based decisions that can complement traditional forecasting approaches. For example, in prediction markets, participants are typically given tokens or toy currency to invest in the likelihood of future events or outcomes (eg for a new product's future success or the result of an election). Analysis can then determine forecast probabilities for the various outcomes. Participants can also be rewarded on the basis of the accuracy of their predictions.

2.4 Coordination & Collaboration

Coordination is when a community is created quickly with the aim spreading information quickly and widely. Increasing connectivity means that groups are able to cooperate and achieve what once was the exclusive domain of large centralised organisations. In organised industrial disputes, social media has the power to rapidly organise and mobilise employees – even when they are geographically or temporally dispersed.

Cloud-based collaborations and productivity suites such as Google Apps for Work and Dropbox, Internal social networks like Yammer or Chatter, or other social collaborative task-based tools like Asana or Huddle, are becoming wide spread. Clearly there is a lot of difference across such tools, although they all have a focus on connecting people, allowing people to interact and to help with collaboration, communication, project management and many others. These tools have the potential to contribute to Collective Intelligence in lots of different ways (eg discussion, idea generation, distributing work, knowledge sharing and Q&A).

3. Challenges for Collective Intelligence

Although Collective Intelligence has evolved alongside humans, the rise of social technologies over the last decade has caused the rapid development of a wide range of tools, systems and platforms. Real-world implementations over this time have taught us a great deal about some of the obstacles and pitfalls that need to be addressed in the development and use of Collective Intelligence tools. The challenges for Collective Intelligence come in a variety of forms. These can be roughly divided into four groups: Challenges in Design, Social-Cognition, Administration and Leadership. These are discussed in turn below.

3.1 Design Challenges

Researchers who are involved with the study of Human-Computer Interaction (HCI) and Collective Intelligence focus on *how* people and computers can be connected to enhance usability and output. The design choices made regarding the user interface of tools are extremely important because potential participants will only get involved if the user interface guides them in a straightforward and meaningful way. Similarly, those interested in leveraging Collective Intelligence require a means by which to administrate, analyse and extract insights from the system. Ultimately, Collective Intelligence requires the design of both technical infrastructure and human-human interaction: a socio-technical system.

This is a salient point because Social Collective Intelligence tools must, by their very nature, involve some means of interaction between participants. This typically takes the form of an online discussion or comments section where participants provide their own input as well as exploring, evaluating, or replying to, the input of others. Online discussions, also known as discussion forums, message boards or comment sections, provide participants with the ability to have conversations in the form of posted messages. Online discussions are almost always hierarchical, or tree-like, in structure and are typically displayed in a list format or thread. Online discussions are ubiquitous across the Internet – most websites, whether they are news sites, blogs, review sites or social networks will have some form of discussion forum or comment section.

It is worth considering, for a moment, the evolution of online commentary and discussion. In the late 1970s, even before the Internet was established, simple bulletin-board systems were being developed. Users were able to look at a list of posts and if they found something interesting they could contribute to the post. This was the first time that user-generated content was the fundamental element of a software application.

Over the years, as various technological advances were made, the functionality of online discussions evolved into the more mainstream social technologies that we see today. Most modern online commentary or discussions still contain basic elements that were produced early in the creation of the Internet and this poses some difficult challenges for Collective Intelligence. These are outlined below:

List-based discussions

One of the most basic challenges is that, due to the accessibility of social technologies, Collective Intelligence tools need to be able to cope with large groups of people. This may sometimes be as small as 50 or 100 people, but it could also be thousands, or even millions, or people. As a consequence, Collective Intelligence tools that present participants' input as comments or posts in a list have serious limitations. The worst is that they quickly become impossible to navigate and can quickly grow to overwhelming proportions. Interacting with other people in a list-based discussion is ok from a user perspective if there are a small number of people (say 20 participants). However, when the number of comments grows beyond this it becomes an enormous problem.

Without a means of effective navigation, many comments or ideas will never be properly evaluated – participants do not have an equal chance of being heard. In online discussions, lists of comments tend to hide the true diversity of opinion that exists, favouring early birds or those with extreme views. Technological advances in graphical user interfaces and gamification are enabling more engaging ways for employees to express their opinions about various work-related issues. Social media that use these techniques have huge advantages over traditional lists of comments used in discussion forums and message boards. Algorithms that share out comments are also becoming increasingly sophisticated and can ensure each comment has been given an equal amount of attention by the community. Interactive visualisations also provide a compelling and engaging experience for participants who can themselves get instant and authentic feedback. This can help to increase participation rates in more discussion-based interactions.

Statistical confidence of evaluations

Employing a system that ensures an equal distribution of participants' input means that the subsequent analysis can be more statistically confident that each idea's evaluation ratings are valid and really do reflect the views of the community. For example, if an idea has only been evaluated by a handful of people, the system may need to obtain more ratings to be confident that the community really do feel that way about a particular idea. Collective Intelligence systems can apply algorithms that include dynamic control. These work by deciding whether a comment requires more ratings to reach a specific confidence interval and adjusts the frequency with which that comment is displayed.

Inadequate evaluation mechanisms

The methods through which participants evaluate each other's ideas and suggestions can make a big difference to the output obtained from Collective Intelligence tools. Typically, evaluations are obtained by rating, voting, liking or assigning a proportion of virtual tokens. However, as outlined above, when there are thousands of ideas displayed in a list, only the ones towards the top of the list that will be read and evaluated. Some systems allow participants to sort the list by the ratings they have received, however, this is still problematic because it is only the ideas near the top of the list get evaluated.

Some evaluation mechanisms are very basic. The most basic evaluation criteria are binary mechanisms such as a simple *like* or *upvote* button. The trouble with these is that they are over-simplistic and do not provide any detail about what it actually is that participants like about an idea –

is it because they agree with it? Or that they think it is insightful? Or that it will be easy to implement? We just don't know. Asking for ratings using more detailed response scales can help, although they still are only able to assess one particular evaluation criteria. Using multiple response scales that refer to different evaluation criteria can help enormously in identifying the best ideas or comments.

Aggregation

In order to obtain Collective Intelligence, there must be mechanisms that transform private judgements into collective decisions – this is *aggregation*. The interconnectivity offered by modern social technologies has huge implications for the way in which individuals' input is translated into collective decisions. There are two main ways of aggregating information or knowledge in organisations. The most common way of reaching a collective decision is by adding all of the individual responses together. For example, a survey can provide a job satisfaction score for the organisation by simply providing an average of individual responses (a similar approach we saw with Galton and his livestock).

It seems reasonable to assume that distributing a survey questionnaire and analysing the results will produce Collective Intelligence – and, to some extent, it does. With a traditional survey, a group of people are asked to provide feedback in isolation and these individual pieces of feedback are then aggregated by a researcher who will analyse the data and report the findings. The intelligence gained from traditional surveys can be considered 'collective' in the sense that the data is being provided by multiple persons within the group. The findings of a survey can also be considered 'emergent' because the intelligence produce does not reside within any members of the group. However, it can be argued that the level of Collective Intelligence provided by traditional surveys is limited – the crux of the matter is the means by which the data is aggregated.

Advancements in technology have allowed new means of aggregation to emerge. In particular, through social technologies, large groups of people can rate each other's written responses on specific evaluation criteria. When these ratings are analysed along the text (using modern text analysis software) it is possible to identify which comments and themes resonate most with the community. As a result, the output is not shaped by an individual analyst or team of researchers, it is shaped authentically by members of the group. Aggregation in social technologies marks such a shift because aggregators can be used to help shape a community's voice, as well as represent and analyse it. It is only through these new technologies and algorithms that we are starting to see, for the first time, genuinely bottom–up, large-scale and collective opinion forming, rather than building responses to questions that reflect the constraints of a particular researcher's thinking.

Time wasting

In online discussions that have large numbers of participants, the same ideas are often repeated and this can sometimes prevent the discussion from progressing. Similarly, it can be difficult to organise and categorise the enormous amount of ideas. Too much time can also be wasted discussing suggestions that are unworkable or impractical, meaning that good ideas can sometimes be overlooked or underdeveloped.

3.2 Socio-Cognitive Challenges

The idea of synergy – that the whole goes beyond the sum of its parts – provides a powerful incentive to consult a group rather than an individual. It seems almost intuitive to us that a group will make a better decision than an individual and it's commonly thought that the performance of a group will be equivalent to that of its best members. While these assumptions seem obvious, however, there also needs to be acknowledgement that, under some circumstances, groups can make terrible decisions.

Various social pressures and cognitive biases can affect the way people behave in a group, and in certain circumstances this can be disastrous. Groups can, and often will, correct individual mistakes in order to arrive at the best final decision, but sometimes group psychology can act to amplify these mistakes. In many cases, these effects are more pronounced in face-to-face group situations. Nevertheless, the impact of socio-cognitive factors can also be felt in online interactions (depending on the use, design and context of the exercise). Some of the most important factors to be aware of are outlined below:

Group decision-making

Social pressures felt within a group, such as social conformity and obedience, can lead members to keep quiet in order to avoid negative penalties such as disapproval from peers and isolation within the group. This is further exacerbated by participants' interpretation of information signals within the group (ie who's said what, and when). These signals can lead people to hold back information they know out of respect to those who have already shared their insights. Take for example, an authoritative figure passionately outlining their argument at the beginning of a meeting – it's likely that a number of group members will subsequently hold their tongues. These influences serve to exacerbate a number of problems that arise in groups. Errors are soon amplified rather than corrected by those avoiding social pressures or respecting and accepting information provided by other group members. Groups can also become victim to cascade effects – this is when a group accepts the decisions or follows the actions of those who spoke first, even if these decisions or actions are wrong.

Cognitive biases

Cognitive biases are mistakes in cognitive processing that can lead to illogical or irrational decision-making. These biases can result as a consequence of the limited processing capacity of our brains, but they also enable us to make quick decisions. Biases exist in online social interactions as they do in real life, however, there's much more scope in online interactions to design systems to overcome many of these biases. Even when biases remain, there is certainly more scope to measure them and design ways by which the output can be recalibrated to take account of their impact. There are at least a hundred cognitive biases that have been demonstrated empirically by psychologists. Some of these are particularly relevant in considering online discussion and evaluation:

- *The backfire effect*: Participants can often strengthen their particular beliefs when presented with evidence that does not support their view.

- *The bandwagon effect*: Participants are more likely to adopt particular behaviours or perceptions simply because many other participants do (this is similar to social herding).

- *The curse of knowledge*: Participants who have more knowledge and expertise in a particular subject area can find it almost impossible to think about the subject from the perspective of a participant who is completely ignorant about the subject matter.

- *The overconfidence effect*: Participants are likely to be overconfident in their own solutions and answers to various problems.

- *Reactive devaluation*: Participants' evaluations of other's suggestions can be negatively influenced by the simple fact that the suggestion was made by an adversary or someone with an opposing perspective.

- *In-group bias*: Participants tend to give more positive evaluations to suggestions from members of their own group – even when the groupings are arbitrary or irrelevant.

- *Shared information bias*: Participants often spend more time debating issues that all participants are familiar with, as opposed to issues that only a minority of participants are aware of.

Fragmentation and polarisation

When debating divisive or controversial issues, groups can often split into one or more opposing groups. As the discussion progresses, fewer participants remain neutral as newcomers are more likely to side with a particular group. This forces the opposing groups further and further apart. When polarisation occurs, interactions across groups can become even more disagreeable, forcing the groups further apart. As a result, evaluations made after a group discussion can sometimes be more extreme than those made by individual participants prior to any interaction. In line with social pressures, participants can also become polarised as they attempt to conform to the norm of their particular group.

3.3 Administrative Challenges

There are a number of administrative and operational hurdles to overcome in Collective Intelligence and there has been a great deal of research to understand how active participation in online communities can be enhanced and maintained. Overcoming these challenges is crucial because human input is fundamental to Collective Intelligence – without enough fuel (and the right sort of fuel), the engine cannot run properly. The main administrative challenges are outlined below:

Lack of participation

Different participants will have varying levels of commitment, expertise and availability. Ideally, the value of individual contributions should not depend on either the frequency of contribution by an individual, or the time that the person can spend reading and contributing to the exercise.

Lack of detail in participant input

Depending on the specifics of the community and the topic being discussed, participants can often provide input that is lacking in clarity or detail, with only a minority making carefully considered responses. Of course, participants need to be able to answer the question or brief they're given, but

more importantly, they need to be bothered to craft considered input and to read and respond to other participants' input.

Anonymity

A common problem is that many organisations do not allow anonymised comments in tools and systems from which Collective Intelligence can be elicited. In some instances, for example ideation and innovation, being named may enhance the quality of the feedback, as the social recognition obtained from coming up with a winning idea can be highly motivating. However, when discussing many organisational issues, what's mostly required is honest feedback, which may be critical of the organisation or its leadership. Many platforms in organisations do not allow for anonymised comments and, as a result, this means that employees are unlikely to be candid in their feedback.

Dealing with conflict and abuse

Without a doubt, most Collective Intelligence tools will produce some conflict. Wherever there is interaction, there can be conflict. A certain amount of conflict can be beneficial if it helps people to understand a more diverse range of perspectives. Some Collective Intelligence systems are designed do this by forcing people to read the comments of people who are different to them in some way and using visualisations to illustrate the diversity of opinion that is largely hidden in list-based discussions.

Some systems can also weight participants' ratings of each other's input to take into account various social, attitudinal or demographic biases. However, in any online discussion there can often be some participants who do not share the general view of the wider community, or even worse, individuals who have set out to deliberately abuse other participants or disrupt the system. These people can often dominate discussions as the attention of other participants is directed away from progressing discussions or ideas to petty arguments.

In this regard, *Godwin's Law* is an Internet saying which states that *as an online discussion grows longer, the probability of a comparison involving Nazis or Hitler approaches.* While this is more relevant to external discussions (clearly, this is less relevant in organisations where people can get into serious trouble for or being offensive on social media), Godwin's Law can help pinpoint when a discussion has gone on for too long. It's useful to know that the rule of thumb in online discussions is that if a person invokes Godwin's Law and makes the comparison, they automatically lose the argument.

Recruiting participants

There needs to be careful consideration of which people are recruited to participate in Collective Intelligence activities and how they are selected. For a start, any collective intelligence tool needs to have a minimum number of active users to have meaningful interactions and maintain engagement. Populations can be as small as 20 to 30 people and potentially as big as everyone who is able to read, write and access the Internet. Obtaining good participation rates is important because having a rich diversity of perspectives is an important pre-requisite for obtaining the best Collective Intelligence. There also need to be participants who are progressive thinkers or who can challenge the status-quo. Participants also need to have the knowledge, understanding and experience to contribute to the

exercise. The question is whether meaningful contributions can be made with little of no specific subject matter knowledge, or whether participants require specific knowledge and experience.

Motivating participants and incentivisation

After recruiting the right people, participants need to be encouraged to share their input and interact with other participants. Participants should be clear what it is they are a part of, why they should engage and what the value is to both themselves and the organisation. Intrinsic motivators such as social recognition, being heard (visibility of contributions), loyalty, having a common purpose or being interested in the subject matter, can interplay with more extrinsic motivators, such as vouchers, money or prizes. Within organisations, acting on the insights obtained from Collective Intelligence exercises is typically a good predictor of future intentions to participate.

3.4 Managerial and Leadership Challenges

Collective Intelligence in organisations poses some specific challenges for management and leadership because tapping into Collective Intelligence means taking a more open and transparent approach – and this requires significant cultural change. The main challenges are outline below:

Loss of control

Taking into account perspectives and suggestions from across organisational boundaries and hierarchies may leave some managers feeling vulnerable. As more work takes on elements of crowdsourcing – moving tasks from one to many – this could be construed by some managers as a sign that they are not doing their jobs properly. There is also a risk that senior figures may perceive the open methods used to gather Collective Intelligence as reducing their power to make decisions. A common theme when talking about leadership in the digital era is that it necessitates a different way of doing things. However, leaders often lack skills and awareness about Collective Intelligence tools that stifles their view of tangible organisational benefits, prevents them from driving change and makes them dismissive and distrusting. In terms of leadership, this means finding an approach that fits a more authentic style of leadership – embracing change, being open to experimentation, demonstrating transparency, working collaboratively and promoting dialogue.

Overcoming resistance

It is not always the most senior leaders in a company who are most resistant to a more authentic way of operating. Often it can be middle managers that are more hesitant about embracing an open approach. This is perhaps because managers at this level are most fearful about any critical feedback being attributed to them. In addition, it is frequently middle managers that own the work streams to which Collective Intelligence can be best applied.

Ethical treatment of crowd workers

The increasing prominence of crowdsourcing and Collective Intelligence tools that facilitate the distribution of work, such as parallel task processing, have given rise to new labour market segments. The global labour market has more freelancers than ever before and there are a number of well-known websites that offer the services of many crowd workers to perform simple tasks. As crowd

workers of the this type increase in number, organisational leaders must consider the ethical and welfare issues involved in using these types of workers.

Intellectual property and security issues

Organisations can perceive certain risks in using Collective Intelligence platforms that relate to intellectual property, liability and data protection issues in allowing discussions in an open forum. If this is the case, agreement should be sought on pre-established terms of participation and ownership of intellectual property. Related to this, there may also be concerns about the open communication that accompanies Collective Intelligence approaches. Inviting large numbers of people to participate in discussing various organisational issues means that more people will be aware of potential problems or solutions.

Lack of action in response

An element with which organisations struggle the most in asking for feedback is instigating some sort of change in line with the insights provided, and providing feedback to participants on the findings and actions taken. In this regard, Collective Intelligence is no different. Yes, the insights may be richer, more valid and more actionable, and participants may be more engaged with the process, but unless leaders and managers act on the insights, the Collective Intelligence obtained is largely useless.

The importance of leadership support in seeking solutions through open dialogue should not be underestimated. This is especially true where organisations need to be seen to respond and act on feedback that is provided in an open forum. A final aspect to consider regarding actionability is that collecting employee feedback in an open, transparent and collaborative environment has enormous potential for participants to actually learn and share information during data collection. This can increase employee's readiness for change in that they are more aware of the issues at hand and are more likely to feel that their voices have been heard.

Creating specific roles

Adopting Collective Intelligence methods can also require the creation of new and specific roles, such as senior sponsors to lend weight to new ways of doing things, roles to administrate and moderate Collective Intelligence activities and people to analyse and implement the output.

4. Conclusion

There are many ways in which organisations are using Collective Intelligence. From ideation to augmenting skills and predicting the future, an increasing number of tools are allowing organisations to more easily address critical business issues. Whatever the specifics of the approach, Collective Intelligence is enabling organisations to tap into the shared knowledge and expertise of their workforce (and beyond) to address their most important business challenges.

Collective Intelligence is nothing new. Successful organisations have been encouraging collaboration and interaction since the first modern organisations were formalised. However, it is *Social Collective Intelligence*, resulting from the rapid development of social and digital technologies, which is both new and exciting in this area. Organisations are only just beginning to appreciate the potential that Collective Intelligence can offer. There are pockets of good practice appearing as organisations start to implement various Collective Intelligence activities. However, these early examples of Social Collective Intelligence are likely to be just the start of the story.

As the area develops and evolves, those who are developing systems and tools for Collective Intelligence will also need to take into account the various challenges and pitfalls outlined in this report. Not only in the design of human-computer interactions, but also taking into account the psychology of social and cognitive processes that occur when groups of people interact on a large scale. Moreover, the way in which Collective Intelligence systems are implemented and embedded within organisations needs to be considered along side the administrative, managerial and leadership challenges that such approaches present.

One issue that emerges quite strongly in this report is that not all Collective Intelligence is created equally – there are levels of Collective Intelligence. Simple survey methodologies do provide Collective Intelligence of a sort, but what they lack is a social element that enables participants to evaluate each other's responses. This is important because when this type of aggregation is provided it is possible to obtain *Social Collective Intelligence* and that's quite a different proposition in terms of the richness of insight produced. If a group is interacting in a system that has been carefully designed to optimise their input and extract insight then the level of Collective Intelligence obtained can be far greater than any survey.

Thinking about the future of Collective Intelligence, it is clear that developments in human-computer interaction are likely to play a big role enhancing human-human and human-machine interaction. However, for many scientists and entrepreneurs, the ultimate aim is to develop hybrid systems that employ both human intelligence and advanced machine intelligence.

The progress being made within the fields of artificial intelligence and machine learning is also likely to be at the forefront of Collective Intelligence as it evolves in the coming decades. At the moment, it is typically the humans that do the 'intelligent' work and computers that do the administration. However, as the processing and storage capabilities of computers increases, is there a risk that human input and creativity will be increasingly redundant? Maybe it is the humans who will be the machines' administrators in the future.

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