

2<sup>nd</sup> International Conference on Leadership, Technology and Innovation Management

## Collective Innovation: A new approach for dealing with society induced challenges. A case study in the Dutch Bakery Sector

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### Abstract

Since many of today's problems are becoming ever more complex, the way we look for and manage innovations to solve these problems should also be innovated. We introduce the 'Collective Innovation' approach to deal with these kind of 'wicked problems' that require the input of many different parties. Furthermore, in Collective Innovation it is crucial not to define the solution space upfront, but to take the time to look for creative, innovative solutions that come from a wide range of angles. A case study in the Dutch bakery sector illustrates this approach and shows that it yields better results than other innovation approaches, such as Open Innovation and Collaborative Engineering. In this approach, the role of the facilitator of the Collective Innovation process is crucial. Also, we adopt a contingency approach to innovation, which means that the Collective Innovation approach is not suitable for every innovation problem or challenge, but only for those that have many dimensions (technical, economical, environmental, and social).

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Selection and peer-review under responsibility of The Second International Conference on Leadership, Technology and Innovation Management

*Keywords: collective innovation, bakery sector, the Netherlands, open innovation, contingency*

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## 1. Introduction

Today's society is characterized by politicians, scientists and other opinion-makers not only as dynamic, but also as increasingly complex. This complexity is caused by many different factors, of which globalization and increasing connections between different 'spheres of life' are just two examples. Simply put, technological problems, for example, are no longer merely technological in nature, but there are also political, economic, and social aspects, making them 'wicked problems'. For example, building a new nuclear reactor is not simply a matter of setting up a sophisticated project plan, but also of taking into account the huge building costs, assessing the technical risks of running the nuclear plant, taking into account possible demands from nearby living citizens, and so on. Furthermore, these issues transcend the nuclear plant itself, and looking at it from a much broader perspective, e.g., the acceptability of nuclear power, will further complicate matters. That is to say, the issue is not one of building a nuclear plant, but of making sure that the future production of energy is secured.

In an earlier study into the innovativeness of the Dutch economy [Van der Duin, De Graaf, Langeler, 2009], we learned from the people we interviewed that these kinds of problems (and challenges) specifically take place within very densely populated areas. Not surprisingly, from that perspective, the Dutch have a long tradition in negotiation processes designed to address social and economic problems that include many stakeholders in society. Although this so-called 'Polder model' may work pretty well when dividing economic surpluses, in the case of finding new solutions to very complex problems it is a much less effective 'managing framework', which means that, to tackle the increasingly complex societal problems, new ways of looking at and dealing with these problems is urgently required.

If we view innovation as a way of dealing with problems and facing challenges, we would expect that innovation management mirrors the (increasing) complexity of business, economy and society. In fact, the history of innovation reveals an increasing diversity of ways to innovate. In addition to more traditional ways of innovation that are characterized by technology push, market pull or a combination of the two, more 'networked' types of innovation management have emerged. More specifically, there have been a number of trends with regard to the cooperation between organizations with regard to innovation. In the 1980s, there was a trend that started with standardization efforts, leading to, for example, the GSM Mobile Telephony standard [Bekkers, Verspagen, Smits, 2002]. Essentially, this was an example of technological collaboration between competitors that would all benefit from a standardized system. Next, in the 1990s, Collaborative Engineering emerged [Willaeart, Minderhout, De Graaf, 1998], where collaboration with regard to innovation mainly took place between suppliers and customers, with the aim of reducing costs, increasing quality and reducing lead time. Chrysler was able to develop its Viper in a very short time using this approach. Then, the innovation system opened up even further around 2000, with the emergence of Collaborative Innovation and its extension into Open Innovation [Chesbrough, Van Haverbeke, 2006], which was applied successfully by companies like Intel and IBM. Now, we introduce 'Collective Innovation' which addresses issues and ambitions not only at a (cross-)industrial but also at a societal level, and often involves public-private partnerships. Figure 1 shows how we compare Collective Innovation to the other types of innovation processes, in terms of the Goals of Innovation and Scope of Cooperation between the parties involved.

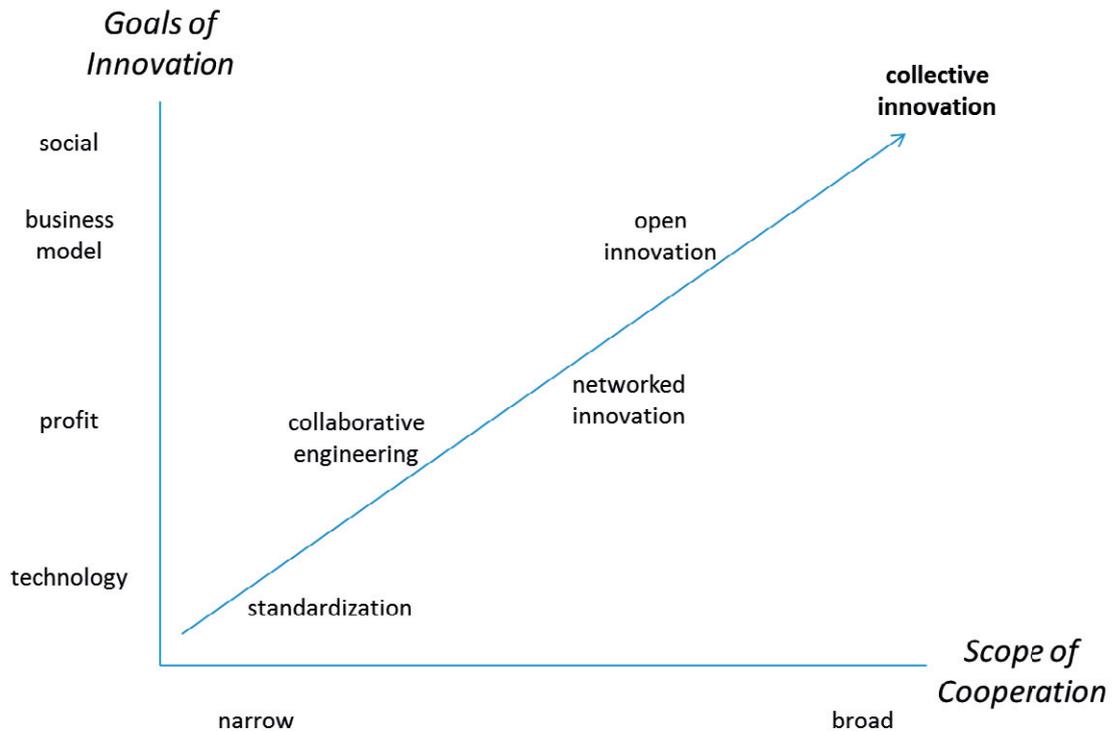


Fig. 1 Various innovation approaches in terms of innovation goals and scope of cooperation.

## 2. Examples of collective innovation

Given the complex and urgent societal challenges described in the previous section, it is not surprising that there are many initiatives that attempt to deal with these problems and challenges. For instance, at Delft University of Technology in the Netherlands, students and professors have taken up the problem of the big environmental problems in South-Africa that are caused by the widespread illegal dumping and burning of tires. By recycling the rubber tires as shoe soles (the ‘Plakkies’) this can now be prevented. Because the shoes are designed by children and manufactured by HIV-infected women, and the profits are reinvested in several orphan-related projects, the Plakkies help address various social and economic problems as well. This means that the problem is not only viewed as a purely environmental problem, but the solutions also have clear economic and social benefits, overcoming the often perceived trade-off between environmental and commercial values. In addition, this example involves more than rich Western people giving money to poor people in Africa, since people in South-Africa have had a major say in setting the goal of the project, while Western source have not so much provided financial aid, but instead they have provided the (technical) knowledge and given the people an opportunity to carry out production themselves.

Another example is that of the Dutch Delta Works. After the big flood in 1953 (which killed 1,800 people), a plan was devised to make the Dutch coasts safer against increasing water levels. Some years ago, the ‘Delta Works’ were finished, not only making the Netherlands more secure, but also giving the Netherlands a leading position with regard to water infrastructure and management. Currently, given the expected rise of sea levels due to climate change, a new Delta-program has been set up, once again, to make the Dutch coast safer,

but also to acquire new knowledge on water infrastructure and management and thus secure the country's leading position in this industry. Also, this is an example in which societal and economic issues are two sides of the same coin, and where many different stakeholders (the Dutch government at different levels, construction companies, citizens, fisheries, environmental organizations, trade unions, and so on) are involved. There are also other examples, such as the collaboration between Sony and the World Wildlife Fund in Open Planet Ideas. However, rather than providing an extensive list of Collective Innovation projects, we want to investigate ways to carry out these types of projects.

### 3. Research questions and methodology

To illustrate and develop the concept of Collective Innovation, we have formulated three research questions:

1. How can Collective Innovation be defined and executed?
2. What are the key guidelines when applying Collective Innovation?
3. What needs to be improved in the current approach of Collective Innovation?

The first research question is meant to define the concept of Collective Innovation and how it can be distinguished from comparable (though different) concepts like Collaborative Engineering, Networked Innovation, and Open Innovation, allowing us to make it clear what the added value collective innovation is compared to the other concepts and when collective innovation is the best approach.

The aim of the second research question is to provide insight into the way Collective Innovation can be applied. It shows which conditions need to be fulfilled to make Collective Innovation a suitable innovation approach, what stages are involved and how the overall process of collective innovation should be managed.

We use a case study involving in the Dutch bakery industry as a framework for addressing the three research questions. Answering the third research question means that the case is not only illustrative but also designed to describe the concept of collective innovation and take a critical look at its application with the aim of determining how it can be improved in the future.

### 4. Case study

#### 4.1. Description of the case

Our case study is about dealing with excess bread in the Dutch bakery sector. We all want fresh bread every day at any time, which will lead to a production surplus as there will be bread left when the store or bakery closes. The surplus is about 100 million loafs of bread per year in the whole Dutch sector.

The first approach to try and reduce this surplus was to use the bake off principle. Bread can be baked to demand at the store or bakery outlet. Although this reduced the surplus to some extent, the impact was not considerable. Next, a Collaborative Engineering approach was used, where bread was processed to produce pig food. However, this only brought €80 per ton in revenues, and only partly resolved the issue, due to high handling costs. Consequently, an Open Innovation initiative was set up to reduce the work involved in making pig food from the excess bread, which led to innovative solutions like edible bags and clips, and automated shredder machines, where excess bread in closed bags was easily transformed into pig food. Because this still left quite a considerable excess, not every bakery was willing and able to invest in this solution. The sector then decided to adopt a different approach, simply stating the problem (halving the excess and doubling the value) and leaving the solution open. Twenty people from within and outside the sector engaged in what we would now call a Collective Innovation effort.

#### 4.2 Process followed in the case

The effort was facilitated by one of the authors of this article, and the process was mainly based on a mix of leadership and innovation tools used along the lines of the process suggested in Van der Duin et al. [2009]. The process essentially covered:

1. Definition of the problem (see previous section).
2. Organizing a public review of the problem and brainstorm for ideas:  
The issue was publicly announced and people from within and outside the industry were invited to come up with ideas.
3. Directing the efforts of the people involved in trying to find a solution, without interfering with the process:  
The Public Relations (PR) foundation for the bakery sector then took the lead in setting up a program to develop prototype solutions in just 60 days.
4. Bundling demand for excess bread products:  
From the ideas that had been proposed, the best ideas (judged by all participants) were selected, in this case 6 out of 25. The groups of participants who were working on these ideas looked for new opportunities for bread in edible and non-edible form.
5. Bundling suppliers to address that demand through new solutions (e.g., new products and services):  
Next, suppliers were brought in to help develop specific solutions based on the ideas that had been selected. Imperfections in the value chain were also addressed to prevent excess due to bad planning and demand forecasting.
6. Partnering public and private parties to commit to development and roll-out:  
When the prototypes were presented after 60 days, the sector, the government and other interested parties set up partnerships to market the prototypes.
7. Rolling out on a small scale to assess market responsive and potential adaptation levels where needed:  
Most solutions were market tested first, both in business-to-consumer and business-to-business settings. Based on the responses, the solutions were developed further for a large-scale roll-out.
8. Scaling up and integrating the solutions in the current business models and value chains:  
With a standardized business model in place, the solutions were then made available to the entire sector, including existing and new suppliers. The PR foundations kept a director's role throughout the process.

#### 5. Results

Interestingly, the solutions that came out of the process could all deal with the entire excess flow of bread if needed and they all yielded at least €200 per ton in on reuse, which was more than double the value of the pig food. One team even managed to set a price for the excess product at four times the price of fresh bread, which would amount to about €8000 per ton. Interestingly, there was also quite some demand for the non-edible excess bread (that which we throw away at home), e.g. using it to heat the ovens of the bakery (a simple burner with a converter would save over €4500 in energy costs a year, against an investment of only €6500), or using bread instead of potatoes to create packaging paper and cardboard. This led to an increased sustainability drive within the entire sector.

On the other hand, reducing the flow of excess bread focused mainly on keeping unsold bread in the supermarket, but as a different kind of product. For example, for French toast, as well as for bread based cakes, matured bread is actually better. By repositioning these bread products to other parts of the supermarket, a new market was created, one that was not just served with the bread itself, but also with

spreads and baking mixes for immediate application at home. Furthermore, best practices in forecasting and planning were shared in the supply chain to better balance production capacity with daily demand. By simply adding 12 hours to the ordering process, the balance between demand and supply improved dramatically.

Of course there were a number of issues that needed to be addressed along the way. In some cases, it took almost a year to market the products, while other products were implemented in a matter of weeks. The director's role of the PR agency turned out to be key in making sure that the effort was successful. Convincing the value chain of the changes that needed to be made to ordering processes and planning turned out to be one of the issues that was harder to solve. However, with the help of public stakeholders, this problem was eventually solved as well. All in all, it proved a very successful effort to solve a problem by using approach that addresses business and societal goals, and that requires very extensive cooperation.

## 6. Conclusion and discussion

### 6.1 Conclusion

In this section we provide our answers to the three research questions.

#### 1. How can Collective Innovation be defined and executed?

Figure shows how Collective Innovation is different from existing types of cooperation with regard to innovation. The main difference is that Collective Innovation serves more than merely technological and commercial objectives. Given the fact that many societal problems transcend technology and/or commerce, an innovative solution that only addresses those elements would be sub-optimal. We define Collective Innovation as follows: "Bringing together a wide variety of public and private parties under supervision, to generate ideas and align those ideas in such a way that complementary solutions can be developed, integrated and implemented that genuinely reduce or solve the collective problems." This means that, contrary to, for example, Open Innovation, the parties involved are involved in the entire innovation process rather than merely one part. Also, in Networked Innovation, a few parties decide upfront to cooperate (for example, the Senseo coffee machine by Philips and Douwe Egberts), whereas in Collective Innovation everybody can in principle join the innovation process.

#### 2. What are the key guidelines in applying Collective Innovation?

In section 4.2, we presented eight steps in applying Collective Innovation. Based on the case study we discussed, we think that keeping an 'open' attitude when thinking about possible innovative solutions, giving room to interested parties and freely discussing the potential of the proposed solutions is essential. In addition, a committed and independent 'director' (i.e., the facilitator of the Collective Innovation process) is also crucial to the process of Collective Innovation in ensuring that the three elements just mentioned are included.

#### 3. What needs to be improved in the current approach of Collective Innovation?

The role of the 'director' (facilitator) should be elaborated, making it more specific what that role involves, especially in difficult situations during the Collective Innovation process. Also, it should be determined what limits there may be when it comes to involving all kinds of parties in the Collective Innovation process. Of course, its broadness in terms of searching for innovative solutions and involving different parties is key to the idea of Collective Innovation. However, somewhere in the process, the

diverging part should make room for the converging part to make sure that the Collective Innovation process yields practical and high quality results.

### 6.2 Discussion

We want to emphasize that we do not see Collective Innovation as a cure to every innovation-related disease. Collective Innovation is only applicable to complex social problems in which many different actors are and should be involved. This means that we advocate a contingency approach, which means that 'one size does not fit all'. If an innovation problem or challenge is mainly of a technological nature, standardization would be the proper approach, and if two or more parties upfront have decided to start up an innovation processes, the networked innovation approach would suit them best. Applying Collective Innovation to problems that are not sufficiently complex and do not have a social dimension will probably yield disappointing results and take far too much time, given the extensive nature of Collective Innovation.

Furthermore, the empirical basis of Collective Innovation should undoubtedly be broadened and strengthened by applying it to many more cases, and it should become clear how and to what extent different types of complex, social problems relate to possible different versions of the Collective Innovation approach.

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