

Centre of Excellence for Steel Production and Metal Manufacturing

- Innovative business development based on university research and organised as a public-private-partnership

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Abstract

This paper describes the establishment, process, and results of a project named CSM (Centre of Excellence for Steel Production and Metal Manufacturing). The aim of CSM was to promote economic growth in the Municipality of Halsnæs. It was a partnership between private and public sector including a university, initiated by the Municipality of Halsnæs in April 2011 and concluded in January 2014. Halsnæs lies in the northern part of the capital Region of Denmark. It was jointly funded by the municipality, the Technical University of Denmark and The National Market Development Fond. CSM aimed at finding new and innovative ways of organising as well implementing university research based business development for SMEs within steel production and metal manufacturing. To achieve this, professional innovation and process consultants were employed as bridge builders. The project has given promising results. It has underlined the need for professional bridge building innovation and process consultants with comprehensive understanding of research as well as business. The final results will be presented and discussed in this paper, and the perspective for a continuation of the project into a new project, based on the lessons learned from this project, will be outlined.

Key Words: SMEs, Public-Private Partnerships, University Research based Business Development, Innovation and Process Consultants, Steel Production and Metal Manufacturing.

1. Background and Introduction

The idea for a Centre of Excellence for Steel Production and Metal Manufacturing (abbreviated CSM) was fostered by a public authority (the Municipality of Halsnæs in the northern part of Zealand, Denmark) and a university (the Technical University of Denmark (abbreviated DTU)). The CSM Project was organised as an institutionalised Public-Private-Partnership (abbreviated PPP) funded by the Danish Government under the National Market Development Fund (former the Danish Business and Innovation Fund) and the Capital Region of Denmark.

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The PPP organisation was chosen in order to investigate how a new model for fostering company growth in remote areas of Denmark would work compared to well-known approaches. These more traditional set-ups include public organised counselling services without risk-sharing from the public services and/or private agencies that deliver the service. The CSM initiative is related to SMEs and it takes into account that innovation and increasing productivity occurs when universities, companies and customers interrelate and develop new or substantial improved products or services in unison.

The project was initiated in April 2011 and concluded in January 2014, with so promising results that a continuation of the project with a broader scope in terms of partners and participants is currently discussed in Denmark.

The overall concept of the project is given in Figure 1 below. As can be seen, the principle is fairly simple: The CSM Project processes business development strategies and plans from the participating companies, applies needed research based knowledge from DTU, and ensures framework conditions from the municipality which are conducive for commercial development. As a result, new products, new companies, increasing market value and new jobs emerge. The new conceptual approach was introduced at the IKT12 Conference in Bournemouth in April 2012 [4]: *Next Practise in University Research Based Open Innovation – from push to pull: case studies from Denmark.*

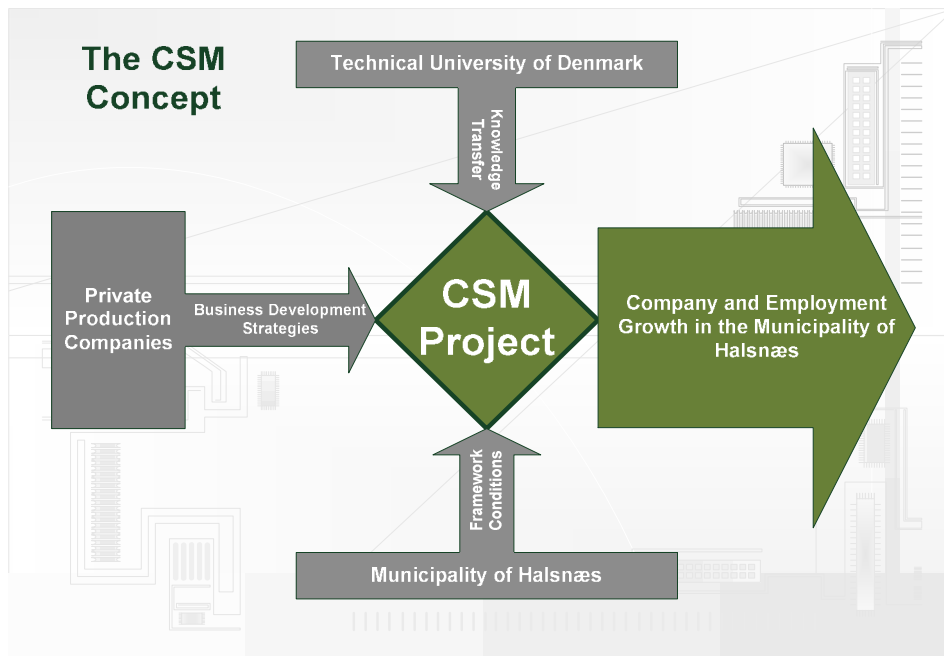


Figure 1: The CSM Project Concept

Chapter 2 describes the project planning and implementation. Chapter 3 is dealing with setting up the complicated OPP construction. Chapter 4 gives an overview of the innovative way that the municipality of Halsnæs approaches its obligations in relation to supporting business development locally. Chapter 5 presents the business development process used on the selected companies. Chapter 6 presents the innovation and product development process. Discussion and conclusion is given in Chapter 7.

2. Project Planning and Implementation

The project was divided into two major phases. The first phase from April 2011 to January 2012 focused on the establishment of the new and complicated organisational structure as an OPP. The second phase from February 2012 to January 2014 focused on the research based innovation and business development in selected SMEs. The first phase was significantly prolonged as it was more complicated than anticipated to set up the organisational structure as an OPP. The final approval of the organisation model was given at the end of 2012 and January 2013 saw the establishment of the necessary organisational entity (see the following chapter).

Consequently, and as the second phase could not start without a proper organisation in place, this phase was significantly shorten. With the effect that the number of companies that could be taken in for the research based innovation and business development had to be more limited than originally planned. In spite of this the project has shown promising results in terms of the organisational model as well as the business model used, and in this context underlining the need for professional bridge building innovation and process consultants with comprehensive understanding of research as well as business.

The important process of selecting companies for participation in the project was conducted in the following main steps:

1. All companies in the municipality of Halsnæs was screened by the municipal business service organisation F5 (see Chapter 4) and steel production and metal manufacturing companies were identified.
2. The identified companies were then contacted by phone by the said organisation with an offer of an introduction meeting in relation to possible participation in the CSM Project.
3. For companies interested introduction meetings were conducted with participation of the CSM Project and a staff member from F5. On these meetings the project and its benefits were introduced, the business process and planning of the company in question were cursory screened in relation to the possible benefit of research based knowledge transfer from the Technical University of Denmark. Further, if positive, the scope and framework of the further process for the company was discussed and tentatively agreed upon.

4. Based on this the companies to be included in the CSM Project was selected in co-operation between the project and F5.

20 companies came out of Point 3, and 7 companies came out of Point 4 to be included in the project.

The business development process were then planned and implemented in accordance with the structure presented in Figure 2 below.

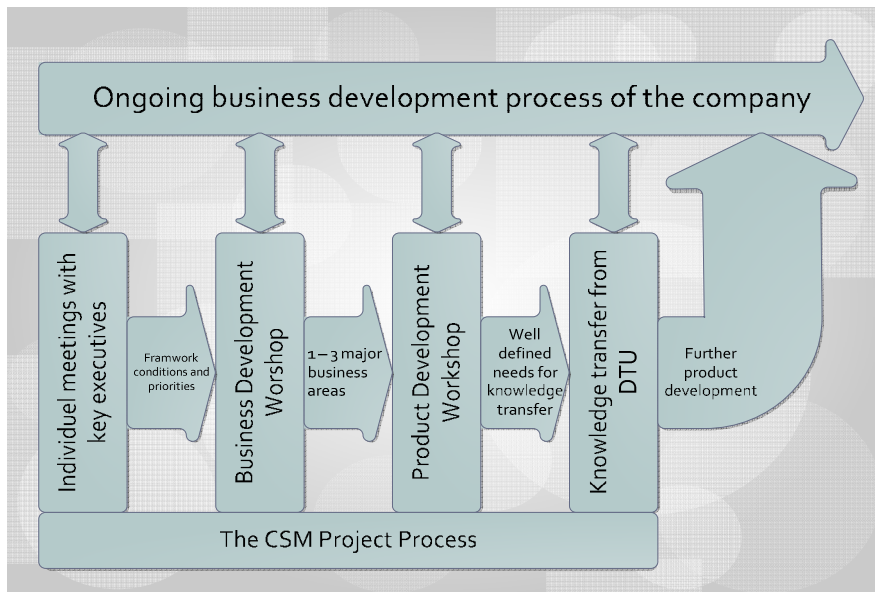


Figure 2: The CSM Business Development Model

The model was used as a framework and not a “strait jacket” and consequently adapted to the individual companies and during the process. However, it was useful for all participants as an overall framework. In accordance with this model the process was as follows:

- The business development within the CSM Project naturally have to be related to and anchored in the ongoing business development of the company in question as shown in the top bar and the four connecting narrow arrows.
- When the business development process within the CSM Project is concluded the results are consequently feed back into the above process as shown with the fat arrow on the right. This was also a requirement from the national funding agency as it is not allowed to increase the commercial competitiveness of individual companies through these kinds of projects. Consequently the moment the process goes into the commercial part via

prototyping, product development and marketing, the project has to withdraw. There is ample room for discussion here if this is a sound requirement.

- The specific process in the selected companies were then planned and implemented in the following four steps:
 - Firstly individual meetings were conducted with top executives of the company in order for the project to understand the business challenges facing the company, the need for knowledge transfer, and not least the capacity of the company to receive, absorb and benefit from research based knowledge transfer. Based on this the following steps were framed and preconditions and priorities were agreed upon (see Chapter 6 for more details).
 - Secondly a ½ to 1 day workshop were conducted focusing on business development, and aiming at identifying 1 to 3 specific development areas where it was jointly recognised that research based knowledge transfer from DTU could be expected to be beneficial (see Chapter 7 for more details).
 - Thirdly a ½ to 1 day workshop was conducted focusing on product development within the 1 to 3 business development areas identified above. The outcome of this should be the identification of specific and concrete knowledge transfer needs in relation to DTU.
 - Fourthly, and as the last activity, the knowledge transfer were conducted from DTU facilitated by the Project.

5 SME companies came through the whole process, increased their competitiveness, experienced growth already within the project period, and further growth in the coming years are anticipated (the areas in question comprised: high end production of zinc, industrial services, process management and energy optimisation for the process industry, advanced metal production and manufacturing, and cyclone emission facilities for the cement industry).

3. The OPP Construction

Public-Private Partnership (PPP) established as consortia is a widespread phenomenon in Denmark between public authorities, research institutions and companies. But as the consortia is a non-legal person, time limited, and with liabilities specified to defined operational task and given R&D activities, the partnership in the CSM Project aimed at forming a legal entity with all partners represented. Such a public-private organisation aiming for local economic growth is unique in Denmark. The CSM Partnership is in other words on a ground-breaking platform of further development of the models for Public-Private cooperation.

In the CSM Project all partners were familiar with establishing legal entities in various company forms. But it was uncertain whether joining an organisation together as partners had a legal foundation for the Municipality and the University.

Neither the acts of municipal activities of fostering entrepreneurship and company growth¹ and university jurisdiction² mention possibilities of Public-Private Partnership, nor are these acts addressing joint organisation of Public-Private - Partnerships. The Municipality of Halsnæs had to investigate the preparatory work of the act of municipal activities of fostering entrepreneurship and company growth. Here it was mentioned that municipalities can choose to form an executive company for its activities towards private companies. The partnership wasn't that fortunate when it came to the University Act. As a general rule universities in Denmark can't form or join a company. Actually only DTU has been able to form a company. But they have done this always as 100% shareholder based on a special appropriation from the Parliament. Public-Private Partnership (PPP) as company formation is from the above sketched perspective impossible, and for a while it seemed like the partners in the CSM Project had to apply the well-known consortia model.

But eventually a solution came up for a Public-Private-Partnership (PPP). The Municipality of Halsnæs has established a company named CSM KS (abbreviation KS in Danish for Kommanditselskab)³ as general partner together with the 2 company partners in CSM as limited partners⁴. KS is in this way the Danish equivalent of a limited partnership company.

As shown in Figure 3 overleaf, the Technical University of Denmark (DTU) has a cooperation agreement with the CSM KS. The Public-Private-Partnership (PPP) is then formed as an institutional partnership including the parties in the red box in Figure 3.

The advantages for the public partners in a KS are obvious. As general holder of the liability for any debts of the partnership, the company can have staffs that are on the municipal payroll because these employees are considered as internal consultants. The CSM KS is in other words not necessarily bound to have long lasting employee contracts, and can be both more flexible and operational when tasks and activities changes to the extent that staff competence are available in municipality. Also the recital that employees are internal consultants lent by the municipality also avoids any public tender obligations. Such tender procedures include a lot of administrative work and are time consuming - especially for an organisation that needs to be pro-active to the markets cyclical ups-and-downs.

To conclude, the partners in the CSM Project found a viable framework of cooperation that goes beyond the limitations of the time limited consortia based cooperation.

¹ The Municipal Act on fostering entrepreneurship, innovation and company growth: LBK 1715 16/12/2010, <https://www.retsinformation.dk/Forms/r0710.aspx?id=134802>

² The University Act: LBK 367 25/03/2013, <https://www.retsinformation.dk/Forms/r0710.aspx?id=145366>

³ The Private Companies Act: http://www.eogs.dk/graphics/selskaber/APS_en.html

⁴ The general partner has the liability for the debts of the partnership while the limited partners have limited liability i.e. they are only liable on debts incurred by the firm to the extent of their investment.

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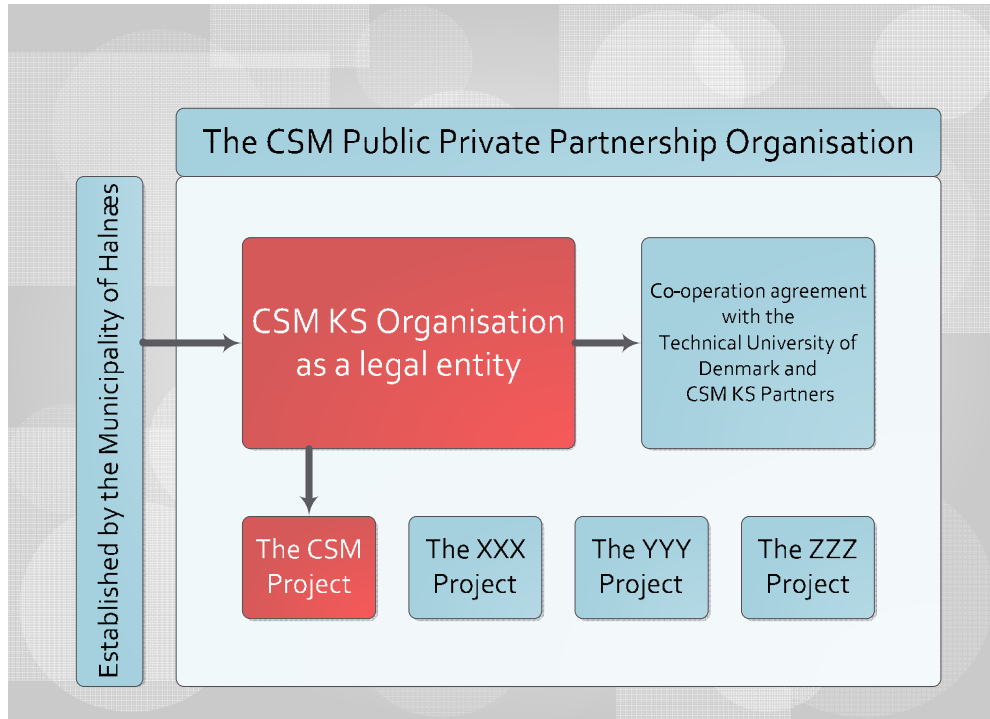


Figure 3: Institutional Public-Private-Partnership in the CSM Project.

4. The Business Development Strategy of the Municipality of Halsnæs and the Formation of F5 Halsnæs Business Service

The need to give municipalities in Denmark greater financial and professional sustainability was the essential catalyst behind far reaching municipality reforms made effective in January 2007 when 270 Danish municipalities were consolidated into 98 units, most of which had at least 20,000 inhabitants. To this effect the municipalities of Frederiksværk and Hundested merged to create the new, larger and more resourceful Municipality of Halsnæs.

The new Municipality of Halsnæs was faced with many new challenges, none more pressing than a need to regenerate business growth locally. For this purpose, it was decided by the Council, in the summer of 2007, to create a strong and active business network that would be able to help to facilitate the new municipality's bid to cooperate more meaningfully with local businesses.

The outcome of this initiative was the creation of a new business network, established in October 2007 and named F5 to commemorate the granting of permission for Denmark's first industrial city, "Friederichswerk" by King Frederik the 5th in 1756. Seeking to create a more representative association; membership and attendance at F5 events was made free. F5's flexibility on this matter allowed

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the network to evolve into over 330 active corporate members. Today F5 is the strongest and most innovative business network in North Zealand and has achieved many of the goals it set out to achieve despite recurring economic crisis in recent years.

In September 2010, F5 organized a workshop that involved the participation of 100 companies, members of the City Council and representatives of the local executives. The aim of the workshop was to try to ensure a strong mandate for the design of municipal business policy for the period 2011 - 2014. At the same time as business life approved the new and first business policy for the Municipality of Halsnæs the Council also approved the final policy formulation at a meeting in September 2010.

The new enterprise policy operates with 6 identified clusters, including the significant steel, iron and metal cluster. This particular cluster employs about 2,000 people, and has both historically and traditionally been the industry for which Halsnæs receives its greatest wealth and recognition. In this light, there was a great interest to strengthen the effort for this particular cluster by focusing on building a project with two main objectives:

- To establish a Centre for steel production and metal processing (called CSM).
- Establishing the CSM as a Public-Private-Partnership (PPP).

The CSM Project had the aim to combine the needs of SMEs and ideas with relevant knowledge from the research world, especially the Technical University of Denmark in relation to creating new products and jobs. The CSM Project as a PPP was solved by using the limited partnership structure with legal personality (see the previous Chapter). This means that Halsnæs is the general partner, while the 2 participating companies Nordisk Staal A/S and MEGA FLEX A/S are limited partners.

Efforts are being made to continue the project in a longer and larger format called CSM2. This will involve the participation of several Danish municipalities, companies and knowledge institutions.

F5 and F5 Secretariat have been working very closely with the companies involved, with Halsnæs and with DTU over the last 3 years, and have generally been the link between the participating parties. The F5 Secretariat has since May 2013 spun off into a separate entity – namely, F5 Business Services Halsnæs - with 4 employees. The unit will also in relation to a possible CSM2 be very active.

The business network F5 now has a professional board of directors composed of business leaders from five of the largest companies in Halsnæs and from politicians in the Council, including the Mayor.

5. The Business Development Process

A business model is basically a framework for making money. It describes the rationale of how a company creates, delivers and captures value. Ideally a business model should be a tactical description of the company's strategy.

In practice, however, we found that many small businesses use neither strategy nor business models in their daily struggle for survival. In fact we have experienced unawareness about the root causes of business performance, and ignorance of how processes and activities are linked within the companies. We call it the *Bumblebee Syndrome*, and with the risk that the Bumblebees suddenly stop flying, we have in the CSM Project aimed to professionalise the management of small businesses by increasing awareness about business performance, business activities, and business processes.

There are many ways in which a business model can be described. In this project we have chosen to use the Business Model Canvas developed by Alex Osterwalder and Yves Pigneur [1]. The business model canvas is a shared language for describing, visualising, assessing, and developing business models. It is based on nine building blocks that show the logic of how a company intends to make a specific value proposition to a specific customer segment. The business model canvas is based on the three constraints of design thinking: desirability, feasibility, and viability. Design thinking is a human-centred approach to innovation that draws from the designer's toolkit to integrate the needs of people, the possibilities of technology, and the requirements for business success [2].

Business models are designed and operated in a specific environment. Developing a good understanding of the business model environment helps one to conceive better, more informed and likely more competitive business models. Continuously scanning of the business model environment is important because the economic landscape is driven by growing complexity, increasing uncertainty, and market disruptions. By understanding the changes happening in the business model environment you can more rapidly evaluate and adapt your business model to shifting external forces. And this is exactly what we have been doing in this project - and with significant results [3].

Activities in the CSM Project have thus given added value to already existing operations or business plans in the involved companies, by changing the way their work is planned and organized, by taking advantage of new knowledge and opportunities, or by introducing new techniques or technologies developed by the knowledge partner DTU.

6. The Innovation and Product Development Process

To listen, understand and adapt have been key words when planning the process and meeting format for a product development workshop. Our goal was not to

deliver a standardised workshop or to create exact solutions. Rather it was to be catalysts for incorporation of university level knowledge into the future products of the companies, ensuring competitiveness and growth.

For some of the companies the CSM Project was their first collaboration with academics. Others had done it before and saw this project as a welcomed access to knowledge, which would normally be out of reach due to lack of human and economic resources.

The processes were based on the initial management interviews including a SWOT analysis and on the business development work as described above. We paid attention to the following three main points:

- How willing is the company to look into new products in new markets compared to optimising existing products and/or existing markets?
- To what extent is the company used to participate in workshops with visionary and abstract content? Just to conduct a workshop with external consultants was so unfamiliar to one of the companies that they initially refrained from exposing their employees to the process/workshop.
- To what extent is the company used to communicating with scientists at the university level? Will the presence of scientists create uncertainty and hamper the idea flow?

We chose not to involve scientists until we were aware of our technical objectives. In some cases the technical objectives were defined early in the process and scientists were involved at the first workshop. In other cases we conducted an initial innovation workshop together with the company before setting up meetings with the university.

One company, an electrical service provider, already had an idea for a new product in an existing market. This idea could lead to additional sales to existing customers. To collaborate with a university was new to them. We decided for a small round table workshop with only the owner, his successor and two CSM consultants present. We worked with the "Value Proposition Canvas" (see the previous Chapter) where we, based on an analysis of the target group's work responsibilities, concerns/challenges and aspirations, expanded and strengthened the product idea. We identified the DTU knowledge that could bring the project forward, found the right connections and initialized the first work meeting.

Another company provides large technical installations to heavy industries and has a unique product in the market. The product represents a significant part of the company's total revenue, but it has a fatal quality issue. If the problem is solved, it could lead to a radical increase in sales. So, even though they also have wishes for new products, they find that a solution to this problem could cause a potential increase in turnover that demands full focus. In this case we chose to bring a maximum of knowledge in from the start and held the workshop as a comprehensive meeting with DTU experts and internal employees with relevant

knowledge. 12 people in total participated. We performed a classic brainstorm, came up with possible causes and then possible solutions. An activity plan for examining each of the issues was worked out. We identified which issues DTU within the framework of the project could investigate further, which they then did. The company was left with a qualified strategy for solving their problem as well as some preliminary research results.

A third company, a sub-supplier with great confidence in own technical abilities, has worked with scientists at university level before. They have excess capacity and are therefore open for an approach on new products and new markets. They also have some manufacturing challenges that require specific research to resolve. Here we managed to conduct rewarding workshops, both with and without scientists. In continuation cooperation with DTU was initialised at several levels.

All companies now have a better understanding of which technological activities can support them in achieving their goals regarding future products. In some cases, these are optimisations of existing products or product ideas, in others they are visions of new products for both existing and new markets. In all cases, collaboration with the Technical University of Denmark has been initiated. None of the projects can be completed within this project framework. Companies will have to continue the cooperation on their own, or maybe with support from the CSM2, if established.

In conclusion, even a few hours of facilitated knowledge transfer can prepare the ground for growth of SMEs. A growth that otherwise seems unlikely to achieve. Findings from this project show that the way forward for effective knowledge transfer is to listen carefully in order to understand the company's own perception of the need for product innovation as well as understanding their experience of working with scientists and based on this adapt process activities accordingly.

7. Discussion and Conclusion

The CSM Project has given promising results in relation to business development for SMEs built on university research and organised as Public-Private-Partnerships. It has underlined the need for professional bridge building innovation and process consultants with comprehensive understanding of research as well as business. In its essence the CSM Project is an illustration of the new demand pull approach from companies to universities. The project distinguishes itself from other public-private co-operations in Denmark because the political and administrative system in the municipality takes an active part in the project not least through the F5 organisation.

The lessons learned from the project can be summarised as follows:

- All partners should be involved in the project not only from project inception but already in the project formulation phase.

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- It is of vital importance with a strong and capable organisation well anchored in the organisation of the project owner, especially at the top executive level. This project benefitted a lot from the continuous interest of the Mayor.
- In this connection it is important with a very clear administrative as well as technical structure for the project right from inception.
- A comprehensive internal as well as external communication plan agreed between all partners is important.
- A strong and experienced project manager is needed with equal legitimacy in the business world as well as the research world. And not least with experience and strong competences in relation to managing complicated multidisciplinary and multi-interest projects, where a hard management hand is needed coupled with a soft and flexible hand when circumstances change as they inevitable will.
- There is a need for longer and more comprehensive project periods in the companies, and a sort of *hand-held approach*, where the SME is supported from idea, over business development, through the innovation process and the knowledge transfer, over prototyping and product development, and finally to the market.
- It is important to include the part that this project was not designed to include namely the financing of the business development.
- These kinds of projects are complicated for all involved consequently it is important right from the start of the project to define, be clear and agree about individual, bilateral and joint expectations. And equally important to be ready and have the capacity for mutual and jointly adaptation and revision of these expectations as circumstances and preconditions change, as they inevitable will.

The results of the project were successfully presented at a national conference in Copenhagen in October 2013 with around 90 participants representing all the interested parties in relation to the project. At this conference it was agreed to investigate possibilities for continuation with a new project with a broader scope especially in relation to partners from other municipalities and universities in Denmark. This is currently under investigation instigated by and anchored in the municipality of Halsnæs, the CSM KS, and the municipal business service organisation F5.

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