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Collaborative and cooperative forms of interaction and their significance for Public Private Innovation Partnerships

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Abstract

The purpose of this paper is to investigate collaborative and cooperative forms of interaction in public private innovation partnerships (PPI), since the form of interaction may have an impact on the work process in PPI projects. The theoretical approach is cooperative and collaborative forms of interaction which is derived from learning theory. Our knowledge about how public and private parties in PPI projects interact with each other is scant. The literature frequently points to PPI project's being characterised by a collaborative work process, where public and private parties are development partners and jointly explore new innovative welfare solutions. However, it seems that PPI projects take far more diverse forms. Empirically two ongoing PPI projects within the hospital sector are investigated. We indicate that a correlation may exist between a high degree of collaborative interaction and the type of PPI projects where the interactive process and end product are perceived as unpredictable. But we do not yet know whether the collaborative approach is particularly good at handling uncertainty and equivocality compared with the more cooperative approach. The benefit to the individual private enterprise in cooperation-based PPI projects is that the defined tasks between public and private parties creates momentum and reduces unpredictability. If the PPI project is dominated by a collaborative form of interaction businesses have the opportunity to participate in knowledge development based on public user needs and gain a deep insight into the public system.

Public-private innovation partnership

In recent years, public-private innovation partnerships (PPI) has become more widespread. Interaction between the public and private sectors is often carried out in order to rethink and develop innovative public welfare solutions. The main argument for creating PPI projects is generally that in order to rethink and innovate there is a need to combine the skills that cut across the public and private sectors. The literature suggests that this can be done. For example, it is documented in the innovation literature, that space for new thinking and innovation is created when public actors join together with non-public actors (Bland et al., 2010: 1, 6). Perhaps

more important is that the basis for creating collaborations across sectors are present, as Denmark (and the rest of the Scandinavian countries) is characterized by a high degree of social capital (Rothstein & Stolle, 2003 : 6), where it is possible to create development oriented and trustful interaction between the public and private sectors. PPI is considered, and not without reason, to be able to unleash a series of potentials that can lead to both welfare and corporate economic opportunities (EBST, 2009: 6; ICPH, 2011:12). PPI is especially in demand when it comes to developing new welfare technologies in healthcare. This is strongly linked to the need for new welfare technology in healthcare, which is large: (Mandag Morgen, 2010): the demand for welfare services continues to rise in line with demographic developments in the country as the prosperity of society generally increases.

In light of the existing literature on PPI, the interaction between public and private sectors can be specifically defined as the parties jointly exploring innovative solutions that are not, on the face of it, known in advance (Dittmer et al., 2009: 241; Weihe et al. 2010: 10): this provides the basis of jointly defined problems (EBST, 2010: 17). This form of interaction differs from the more familiar public-private partnerships (PPP) as the parties in PPI are considered to be development partners and not just customers or suppliers (EBST, 2010: 17). By creating an innovative working relationship between public and private parties, it is expected that additional value will be produced compared to that achieved via traditional relationships between public and private parties.

Although the literature on PPI is still in its infancy (Munksgaard et al., forthcoming contributions), and experience with PPI projects is still limited (Weihe et al. 2011: 14), there are a number of studies of Danish PPI projects (EBST, 2009; Voss, 2009; Weihe et al. 2010; ICPH, 2011; Weihe et al., 2011). The aim of these studies has often been to distinguish what characterises a successful PPI relationship. In this context, the importance for PPI projects of establishing commonality of purpose, mutual trust, open dialogue and communication between the public and private parties are stressed. A number of factors are also highlighted in connection with most definitions of PPI working relationships. However, research also shows a variety of forms of interaction between public and private parties when PPI is investigated in practice (EBST 2010: 22; ICPH 2011:31; Clarke et al., 2011), suggesting that interaction in PPI projects is not always dominated by the aforementioned factors. So, to better understand the different approaches to PPI, it is appropriate to draw on theory from related research fields. Theory from related research fields allows us to attain a better understanding of how PPI works and thus make visible the ways in which PPI interaction is practiced; particularly highlighting the advantages and limitations related to its various forms.

The PPI literature does not distinguish between the two theoretical concepts Cooperation and Collaboration, which represent fundamentally different forms of interaction. The two concepts can however be gainfully used to illustrate the advantages and limitations that may be inherent in the working relationship between public and private parties when entering into various forms of interaction with

each other. Consequently, theory of cooperation and collaboration (Dillenbourg et al. 1996; Roscelle & Teasley, 1995; Bang & Dalsgaard, 2005) are included in this paper to obtain a better understanding of what happens when public and private parties come together to act as joint development partners in the innovation process. This is important because in practice, PPI working relationships generally include elements of both the cooperative and collaborative forms of interaction. The extent to which the blend of the two approaches affects PPI working relationships is discussed in the paper. Through a observational research of two on-going PPI projects from the hospital sector, we address the question: What are the advantages and limitations created by both collaborative and cooperative approaches to PPI projects?

The paper is structured as follows: the opening section discusses the literature on cooperative and collaborative forms of interaction. This enables examination of the theoretical basis for identifying the advantages and limitations of the two different forms of interaction when it comes to creating a PPI working relationship. This is followed by a review of the method used to throw light on the two PPI projects from the hospital sector, and thereafter discussion of two empirical cases that the paper uses to illustrate how cooperative and collaborative elements come into play in PPI projects. Finally, the paper concludes by deriving general learning and recommendations from the two empirical cases.

Theory of Cooperation and Collaboration

The following presents the theoretical foundation for cooperative and collaborative forms of interaction in order to identify the advantages and limitations of the two different forms of interaction in the innovation process in PPI.

Research on cooperation and collaboration is often based on learning theory; especially the branch of learning theory[1], which through the 1990s focused on how interaction in groups creates collaborative learning (Dillenbourg et al., 1996: 1). The prerequisite for collaborative learning is to build a common social context around a common objective (Bang & Dalsgaard, 2005: 8). Within the organisational literature, Keast, Brown and Mandell look beyond cooperation and collaboration to a third form of working together that they call coordination (Keast et al. 2007: 25). Since coordination can be argued to be a consistent feature within both collaborative and cooperative interactions we look at the theory of collaboration and cooperation separately from coordination as an independent working relationship.

Typically the literature discusses collaborative and cooperative forms of interaction as two opposing archetypes. In their definition of the difference between cooperative and collaborative forms of interaction Roscelle and Teasley (1995) point out that the distinction between the two forms of interaction rests on how a task is shared: »*We make a distinction between 'collaborative' versus 'cooperative' problem solving. Cooperative work is accomplished by the division of labour among participants, as an activity where each person is responsible for a portion of the problem solving. We focus on collaboration as the mutual engagement of*

participants in a coordinated effort to solve the problem together« (Roscelle & Teasley, 1995: 70). In this distinction it is established that the tasks in a working relationship are more divided between the parties when the interaction is cooperative, whilst the tasks in a collaborative working relationship are more concerned with the parties' joint commitment to the tasks. The distinction between cooperation and collaboration is elaborated in the literature through a number of key dimensions that describe key characteristics of each of the two forms of working relationship. These dimensions are summarized in Table 1.

The collaborative form of working relationship explicitly includes the parties working together to solve the tasks communally (Dillenbourg et al., 1996: 2; Bang & Dalsgaard, 2005: 3), making the parties mutually interdependent. On the other hand, the cooperative form of working relationship distributes the work among the parties themselves. Dillenbourg and Bang characterise cooperation as a partnership where the tasks are largely divided into subtasks by the collaborating parties who each work independently of each other (Dillenbourg et al., 1996: 2; Bang & Dalsgaard, 2005: 3). Therefore, to a great extent, the cooperative working relationship involves coordination and assignment of tasks or projects, which also implies a clear positioning of responsibilities among the parties. This means that it is not necessary to know what the other parties are dealing with. The result is that the cooperative working relationship is associated with a certain level of predictability in terms of both the end product and the whole process, since the cooperation is based on a division of labour, with the parties separately assuming responsibility for solving the defined tasks. Here, the partners each function within the context of their own work.

The collaborative working relationship however, is characterised by unpredictable processes where the parties do not divide and delegate responsibilities for performance of the task. The process is based on togetherness, which means that collaboration is largely characterised by mutual dependence and responsibility between the partners (Bang & Dalsgaard, 2005: 2). Joint undertaking of tasks also means that it becomes possible to move work in new directions through the collaborative process, which to a great extent relates to the idea of the PPI, where the solution is not known in advance of the collaborative process. Collaborative interaction is defined more specifically as follows: »Collaborative interaction is characterised by several persons acting jointly and with the common goal to resolve a task, and members of the working community are mutually dependent on each other and feel a sense of mutual responsibility« (Bang & Dalsgaard, 2005: 2). The parties are working here within a common context. Table 1 summarizes the key dimensions that exist in the theoretical approach to cooperation and collaboration.

Table 1: Key dimensions of Cooperation and Collaboration		
Central Dimensions	Cooperation	Collaboration
Distribution of tasks and responsibilities	Separate assignments / distribution of tasks and delineation of responsibilities	Joint problem solving / community and common tasks
Dependency	Mutual independence	Interdependence between the parties
Predictability of the end product and process	Predictable processes, and predictability in the work process in terms of end product	Unpredictable processes and unpredictability in the work process in terms of end product
Context	Different contexts	Common context
Type of Task	Demarcated tasks	More open tasks

The archetypes of cooperation and collaboration do not however exclude each other (Dillenbourg et al, 1996: 2). This means that in practice they do not necessarily occur solely in their pure forms, but rather as combinations of the two forms of interaction as is often found in empirical studies. Collaboration does not therefore exclude the distribution of subtasks that largely characterise cooperation. (Dillenbourg et al., 1996: 2). The definition of collaboration may therefore be ambiguous. Characterisation of a working relationship as cooperative or collaborative is therefore not a static framework, but rather something that can change over time in a working relationship and depend on the task's character. However, in terms of understanding, it is fruitful to distinguish between cooperation and collaboration as a working relationship can tend to be more influenced by one or the other forms of interaction. The blending of the two forms of interaction is precisely what we will look at when the two empirical cases are discussed.

Method

The empirical base for the paper is two on-going PPI projects that are both top-down initiated work (Clarke et al., 2011) focused on the development of new welfare technology solutions for the hospital sector. There are also PPI projects in other areas, but the need for welfare technology solutions in the healthcare area is large (Mandag Morgen, 2010: 29) since the quantity and quality of the Danish welfare services is challenged by demographic trends and from rising prosperity in society.

The projects were selected based on the criteria that they must be on-going PPI projects that provide specific insight into how PPI projects are addressed in practice. The projects were also selected so that they included empirical data from where the involvement of private parties occurred both early and very late in the process. Thus, a conscious choice was made to select PPI projects where the collaborative and cooperative elements were respectively high and low. The projects thereby span the continuum between a cooperative and collaborative approach to the working relationship.

The empirical study of the working relationships in the two projects is based on a single case in each project. The projects include more cases, but since the purpose of this paper is to illustrate the advantages and limitations of involving various combinations of cooperative and collaborative interaction, two typical cases

(Maaløe, 1996) were selected. Neither of the cases in the two projects are complete illustrations of either a cooperative or collaborative form of working relationship – both cases are exemplifications of mixing the two types of interaction where one of those forms dominates. The two cases are comparable because they both aim to develop a concrete product through the PPI project.

Inspired by the theory of cooperation and collaboration, the effects of collaborative and cooperative elements on the innovation process in the two PPI projects is investigated. Specifically, two cases in the two projects have been studied through observational research, in order to exemplify how collaboration and cooperation are expressed in the innovation process. The observations took place in connection with the holding of various types of meetings where the public and private parties met face to face. One of the projects constituted a longitudinal observational study of 1½ years where the process in 9 meetings was observed. The second project was followed for half a year during which the process of 3 meetings was observed. The number of meetings and the project duration in the two cases varies and is not indicative of a difference in the momentum of the two projects, rather the number quantitatively testifies whether cooperative and collaborative forms of interaction respectively dominate the two cases. The observation technique has been open participant observation, as this observation technique is very suitable for studying working relationship processes (Andersen, 2005: 156). An observation guide, based on the theoretical dimensions of cooperation and collaboration, has been employed (see Table 1). In the following presentation of the two projects, the cases are presented anonymously.

Presentation of two PPI projects from the hospital sector

'The fully automatic central sterile department and procedure pack' (DEFU STEP) is a public-private innovation project, running from 1.1. 2010 until 31.12. 2012. The project focuses on central sterile departments in hospitals, and in the early start-up phase four subprojects were identified. The aim is to develop and produce relevant tools and design elements, including procedures for design and innovative procedures for the health sector – specifically, automating central sterile departments with the focus on future engineering methods and techniques. For the health sector the PPI project is expected to result in increased efficiency and less attrition of personnel. It also seeks to improve bacterial control in the process of re-handling instruments. One of the cases that this paper focuses on is from the DEFU STEP project and called *Case 1*. The case is a subproject on which the public and private partners have worked together since the start of the project. The case was observed throughout a 1½-year period.

'User-driven innovation for the development of welfare technologies' (BIV) is a public-private innovation project also running from 1.1.2010 to 31.12.2012. The project is open, meaning that new subprojects are being continuously developed. The aim is to ensure the use of user-driven innovation in the development of welfare technologies and to disseminate user-driven innovation among both users and private providers of welfare technology products. The second case study in

this paper comes from the BIV project and is referred to as *Case 2*. The case is a subproject led by a public authority and no fixed private parties were affiliated to the subproject in advance. The private partners have been involved late in the process. The case was observed over a six month period.

Table 2: Overview of the two PPI cases

DEFU STEP: Illustrated by *Case 1*	*Case 1* aims to develop an autoclavable case cart trolley for central sterile departments in hospitals. The public and private partners have been part of the subproject for an equal length of time. The result of this process has been the development a prototype of a trolley that was tested on one of the participants' business. *Case 1* consists of two public and three private parties as well as a project manager.
BIV: Illustrated by *Case 2*	*Case 2* aims to develop a concept for tableware for the care of patients in hospitals that will help patients eat more and better. According to the National Health Service the hospitalization period for medical patients can be reduced by an average of about 3.5 days through better nutritional care. The public authority involved the private parties in the subproject at the end of the process where the concept for tableware was developed. *Case 2* consists of 3 public parties, and 5 private parties.

Discussion of cooperation and collaboration in two PPI projects

The following examines how the mixing of collaborative and cooperative working relationships affects interaction in the two PPI projects exemplified through two case studies presented in Table 2. The core dimensions of cooperation and collaboration used in Table 1 represent the theoretical framework for the empirical case study.

Distribution of tasks and responsibilities

The distribution of tasks and responsibilities characterises the degree to which work tasks are performed together or as delegated subtasks, so that the parties can work independently.

The characteristic of the first part of the innovation process in *Case 1* in DEFU STEP is that the relationship between public and private parties stands out from the ordinary customer/supplier relationship where the solution is known in advance. Only once the parties had jointly agreed on the challenges facing the central sterile department area, and how the solution should be designed did the division of tasks become more dominant. A clear example of joint problem solving was observed at an all-day meeting at the beginning of the innovation process, where there was a close dialogue between the involved private parties from the aluminium industry and nurses from two different central sterile departments. The meeting was characterised by being a search process to jointly arrive at the construction of a case cart trolley. Here the very technical possibilities and proposals from the private parties met with the nurses' more practical approach in relation to how the proposals for a new type of case cart trolley would improve work processes at a central sterile department. There is a tendency for the first series of meetings at the beginning of the innovation process to be characterised by

collaboration through joint problem solving. Subsequently however, cooperative elements enter the collaborative process, because in order to speed up the process, the parties distribute a number of tasks among themselves, so the goal to construct a prototype to be tested during the few months can be realised. This combination of cooperation after collaboration seems to have made it easier to drive the project forward. That there has been a »common ground« within the division of responsibilities and tasks defined between the parties may have made it easier to get the various parties to get involved and take responsibility for providing partial solutions, for example in connection with the execution of testing the prototype of the case cart trolley.

In *Case 2* in BIV the relationship between public and private parties can largely be characterised as a true customer/supplier relationship, as joint problem solving between the public and private partners has not been dominant. The case is however dominated by separate assignments. It can be observed, by the division of tasks, at what point the private parties became involved in the project. In this case the private parties were presented with predefined tender documents, as the basis for a dialogue on how detailed the products must be before companies / suppliers begin to develop prototypes. In a dialogue between the public authorities and private companies, it is thus clear that the task is divided. Specifically, this is reflected in the fact that it is not incumbent on businesses to become part of an innovation process, but instead to deliver a prototype(s) of parts of the pre-developed tableware concept. The clear division of separate tasks has limited the possibility of a common innovation process with close relationships between public and private parties. However, there has been an innovation process before the involvement of private parties. The actual development of the concept of tableware is based on a field study, which among other things has included observations of the food's path from the pots in the hospital kitchen to the patient wards, along with interviews with staff and patients about the food and the dining experience. The identification of user needs has subsequently formed the basis for developing the tableware concept. However, this has happened without the involvement of private parties.

Dependence

The dependence between the parties in the working relationship characterises the degree to which the parties are interdependent. The working relationship may thus be characterised by whether the parties work independently of each other or whether there is mutual dependence between them, which expressly calls for a need to draw on each other's skills.

Case 1 in DEFU STEP has largely been characterised by mutual dependence between the parties. In the case study, it was, for example, observed that a single private company possessed advanced technical expertise in the sterilization of hospital instruments, which they entered into a dialogue about, and which affected the design of the case cart trolley in which medical instruments are sterilized. Furthermore, it was also observed that public partners shared their knowledge of

work processes within a central sterile department, so that the working environment was also taken into account in the design of case cart trolley.

Case 2 in BIV has been characterised by mutual dependence in terms of knowledge sharing and the exchange of expertise between public and private parties. In the case study, the public party was however, dependent on the companies that were presented with the tender documentation being interested in developing a prototype of part of the predefined product before it was sent out to tender. Several of the private parties, however, were sceptical about the development of a prototype that could be displayed to the hospitals, because it involved high costs for them. At the same time they were uncertain about the business potential of the tableware concept. It has therefore been difficult for the public party to attract firms, even though an actual tender was part of the project.

Predictability in the end product and process

Predictability / unpredictability in relation to the finished product reflects whether the work processes at the meetings of the individual cases are predictable or not. When the final end product is relatively unclear, there is also a tendency for collaborative processes to be unpredictable and for less clearly delegated tasks between the parties.

In *Case 1* in DEFU STEP the private and public parties are involved simultaneously from the beginning of the project and thus both participate in the entire process. Although the goal of *Case 1* can be said to be very specific, namely to develop a case cart trolley for the sterilisation of surgical instruments in a central sterile department, different types of unpredictability have influenced the working relationship. Unpredictability has initially been focused on the technology to be used and how the case cart trolley was to be formed and the functions the vehicle should possess. Furthermore, the collaborative process was characterised by unpredictability in terms of the testing of a prototype, whilst at the same time the parties have had to deal with unpredictability in how the new case cart trolley would be incorporated into the processes in a central sterile department. Unpredictability has resulted in a high degree of uncertainty, which the parties attempted to deal with through dialogue on several occasions, such as the exchange of information about the features of the central sterile department and testing of the prototype.

Case 2 in BIV illustrates an example of a predictable process between public and private parties. Here the end product is carefully thought through in advance of the private parties being involved by the public authority. The final product consists of a tableware concept for hospitals, which has been developed by the public party before the private parties are involved in the process. Predictability in the process is especially reflected in the fact that private parties are involved in the process with a clear objective to develop a prototype of a portion of the tableware and to meet specified goals etc. concerning the tableware. Companies are therefore involved as contractors and not as development partners in the innovation

process. The high degree of cooperation in the working relationship is shown very clearly by the fact that meetings are not characterised by the public and private stakeholders together defining problems and solutions in a common innovation process. On the contrary, in *Case 2* the solution was predefined before the private parties were involved.

Context Type

Context type illustrates whether the relationships between the public and private parties are linked to a common working context or divided into separate contexts in which they work independently.

In *Case 1* in DEFU STEP the public and private parties are involved simultaneously from the beginning of the process. This has meant that the parties had a common starting point in terms of building a shared context, which has provided a framework for a common working relationship. This has been an advantage in the case of DEFU STEP, because private parties have thus been able to contribute their expertise and understanding of what is technologically feasible, whilst the government parties have been given the opportunity to contribute their knowledge of how the work processes at a central sterile department typically occur. The intense interaction and relationship building between the parties has thus created a common language, which eventually helped to facilitate understanding and dialogue between the public and private parties.

Case 2 in BIV is to a greater extent characterised by a low degree of interaction between the public and private parties since the private parties were not involved early in the process. This has meant that private and public parties have not achieved an understanding of the context in which they each work, which has constituted a barrier to the forging of closer working relationships and mastering the cultural barriers that exist between the public and private sectors. In addition, the low degree of interaction led to the public and private parties bringing their unique skills into play in a shared context. The form of interaction between public and private parties in *Case 2* of BIV has been characterised by two distinct and segregated work contexts where the public party has been considered as a possible buyer and the private parties as potential sellers of tableware.

Task type

The type of task can consist of open tasks and, to a greater or lesser degree, more closely defined tasks. Open and joint problem solving means that it becomes possible to move work in new directions through the working relationship, while more limited tasks reduce this possibility.

Case 1 in DEFU STEP exemplifies the combination of open tasks and defined tasks. The open problems are more pronounced at the beginning of the project, in which the parties engage in dialogue about the end product's design and development. There is a tendency for the work tasks to become more defined when the parties have reached agreement on how the final end product is to be designed.

Case 2 in BIV exemplifies a high degree of defined types of task. This can particularly be seen in that the private parties here are involved in a meeting where the process is characterised by the distribution of very defined tasks. The process between public and private partners is thus characterised by a technical dialogue before an invitation to tender was implemented and by a lower level of genuine joint innovation where the parties interact to explore innovative solutions, which are not already known in advance.

Advantages and limitations of the cooperative and collaborative forms of interaction

Case 1 and *Case 2* are both PPI projects that share the common aim of developing a material product. However, *Cases 1* and 2 are also illustrations of the significant differences that can exist in the forms of interaction between public and private parties involved in PPI projects.

Case 1 in DEFU STEP is largely characterised by collaboration, but is also combined with cooperative elements, which comprise a division of labour. This kind of combination seems to work when the collaboration comes ahead of cooperation, thus forming a space for joint innovation by developing a common definition of both the problem and solution before the parties work separately. Collaboration at the beginning of a project provides the synergy and a common understanding of each other's differences, which may help to overcome the cultural barriers that can exist between public and private parties. At the same time while creating a common understanding of the aim of the innovation process a common language is created. The interdependence between the parties creates value at the beginning of the process because the private parties are dependent on the nurses ('users') knowledge of equipment and processes in a central sterile department. Meanwhile, the government parties rely on the private parties' technical knowledge of what can be done in relation to rethinking equipment and processes in a central sterile department. Cooperation as a successor of collaboration supports the creation of progress in the projects when the work and responsibilities are based on a common specific solution to which the parties have committed themselves.

Case 2 in BIV has to a great extent been characterised by cooperation, where the starting point for the working relationship between public and private partners has been based on the specification of the tender documents. Cooperation helps to ensure progress in the projects through the division of tasks between public and private parties in order to deliver a specific component. This reduces the unpredictability of the process and project solutions and can provide a temporal advantage in terms of the visibility of specific solutions. The lack of joint problem solving and close relations between the two parties may mean that there is a lack of knowledge creation based on the understanding and use of each other's skills. The low degree of collaboration between public and private parties creates a tendency for private parties to miss out on the values that collaboration leads to in a PPI project. These are values that arise as a result of close relationships between public and private stakeholders in the innovation process. In particular, the value of collaboration finds expression in the form of joint knowledge development: this

arises from the ability to create close interaction between the parties' competences in order to innovate their way into new products targeted at the Danish hospital sector. Additionally, collaboration achieves a greater understanding of cultural differences between the public and private sector through building a shared context and a common language.

Table 3: Identified advantages and limitations of collaboration and cooperative

	Advantages	Limitations
Collaboration	***Common context*** – common understanding of goals, common language and the handling of cultural barriers across sectors. ***Interdependence*** – interaction and the use of different skills.	***Unpredictable solutions*** – uncertainty over what the collaborative process will offer and what kind of end product can be achieved. ***Lack of progress in the process*** – there may be a long time before solutions become visible, which can create uncertainty among private parties.
Cooperation	***Distribution of defined tasks*** – generate momentum in the project and reduce unpredictability.	***Different contexts*** – lack of understanding and use of each other's skills.

Conclusion and perspectives

Public-private innovation partnerships (PPI) are often articulated as part of the solution to challenges facing the welfare society, especially in healthcare. There is the possibility through PPI's to innovate across the public and private sectors with the aim of developing new welfare technologies and creating economic potential for business by integrating the strengths of both the public and private sectors. However, there are big differences in how PPI projects are practiced in relation to which form of working relationship is created between public and private stakeholders in the innovation process.

Through observation of two PPI projects this paper has provided a deeper understanding of what happens when public and private parties enter into a working relationship with each other. It is apparent that PPI partnerships can vary in the degree of cooperation and collaboration, and that these different forms of interaction have their advantages and limitations. An important point is that before the beginning of a PPI project it is necessary to identify what end result is desired between the public and private parties; then the type of working relationship can be selected.

In particular, the empirical cases show that for private companies there can be significant advantages and limitations from engaging in cooperative and/or collaborative PPI partnerships. The benefit to the individual private enterprise in cooperation-based PPI projects is that the defined tasks between public and private parties creates momentum and reduces unpredictability. One fairly obvious business potential can thus perhaps be more easily assessed and achieved. However, if a company is getting into this type of PPI relationship with an expectation of achieving the benefits that are particularly characterised by collaborative work (such as dialogue and knowledge development based on public user needs and a deep insight into the public system) this is not necessarily the case. Conversely if

the PPI relationship is dominated by a collaborative form of interaction between the public and private parties working closely with each other, businesses have the opportunity to obtain a close dialogue with government partners and to help shape the innovation process and thus the final output, which has not been fully determined in advance. In return, the private companies have to handle the uncertainty and ambiguity that often occurs and manage the innovation process, which can be perceived as lengthy and chaotic.

In this paper we have not discussed the role that procurement rules play in the process of the working relationship in the two PPI projects. However, it is conceivable that these rules set some important boundaries for interaction between public and private parties. For example, it is clear that PPI projects are generally affected by structural parameters (Martin et al., 1997), where the EU procurement rules can have a significant impact on what the interactive process in a PPI looks like, regardless of the form of working relationship. The cases in this paper illustrate that there is a higher degree of collaboration in pure development projects (*Case 1* in DEFU STEP), where a tender is not part of the project, whilst there is a high degree of cooperation and almost no collaboration on development (*Case 2* in BIV), where a tender is part of the project. However the projects are still running, so any conclusions are still tentative. DEFU STEP unlike BIV has not been focused on a tender, and the topic has not been touched upon in the joint working meetings in *Case 1* until 1½ years after the project start-up. This might have favoured the collaborative interaction in the innovation process, but the tendering problem still exists because the private party assumes the risk associated with being declared incompetent, and thus risks being unable to participate in a potential subsequent procurement procedure, when the project is completed. In this respect it should also be emphasised that an on-going publication of results in a publicly funded development project means that private parties cannot avoid other (possibly competing) firms also becoming aware of the output arising from the innovation process. In return, the private parties are able to avoid gaining competitive advantages that might prevent them from participating in any offer at a later date after completion. How procurement rules specifically affect various PPI working relationships, and whether a subsequent tender invitation or lack of tender invitation is an advantage or disadvantage requires further research beyond the scope and focus of this paper.

In this paper, we also indicate that a correlation may exist between the type of PPI projects where the interactive process and end product are perceived as unpredictable, and the degree of collaborative interaction that occurs. However, we cannot, with the empirical data we present, confirm this. But in the literature there are discussions, which suggest that this may be the case. Some organisational theorists emphasise that when organisations have a high degree of uncertainty and equivocality present, there is a need for an increased exchange of views in order to 1) clarify equivocality, 2) define problems, 3) overcome disagreements and 4) agree (Weick 1978, Daft & Lengel, 1986) i.e. conditions that are specifically addressed by collaborative interaction rather than through cooperation. Specifically,

Daft and Lengel (1986) define uncertainty as lack of information, while equivocality is understood as being several competing interpretations of a situation (p.556). Uncertainty and equivocality can arise in several situations where it is necessary to discuss the technology to be used, the objectives to be set and how the project should be run in relation to the need for coordination and management and how external factors should be handled: conditions specifically expressed in *Case 1* in DEFU STEPP. However, we do not yet know whether the collaborative approach is particularly good at handling these types of uncertainties in PPI projects compared with the more cooperative approach.

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Notes

1. There are various theoretical approaches to collaborative learning, which come from psychology and distinguish between a socio-cultural approach and a social constructivist approach. The socio-cultural approach takes as its main foundation, the work of psychologist Lev Vygotsky, whose school focuses, among other things, on the relationship between social interaction and individual thinking (Dillenbourg et al., 1996:4). The rationale for this school is that culture and environment affect people's thinking. The social constructivist approach focuses on the interaction between individuals and the importance of cooperation. The psychologist Willem Doise helped to shape the social constructivist school (Dillenbourg et al., 1996:3) and he indicates that: »It is above all through interacting with others, coordinating his approaches to reality with those of others, that the individual masters new approaches«(Dois; Palmonari, 1984:11).