*Public-private innovation collaboration, innovation, and entrepreneurship in the Danish healthcare sector.*

- *The explorative case of AppCare*

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# 1. Introduction

As one of the very core economical pillars of society, the population's health affects its ability to earn an income and keep the economy running through spending it on goods and services. Government therefore devotes special attention to the health care sector, despite various political standpoints. Developing the sector, improving the overall standards in society and focussing on innovation is therefore one of the main concerns of governments. (Grebel, 2011, p. 17)

Developing the technical possibilities and increasing the level of service is not something that comes for free, and when considering the long run, national expenses to the healthcare sector in OECD countries, has only moved in one direction, upwards. (Grebel, 2011, p. 1) tracked over a 40 year period, expenditures in the U.S. have risen from making up for 7 % of GDP[1] to 16 % in 2007. A tendency that describes the development of the OECD countries, although U.S. has the highest starting point and growth. (Grebel, 2011, p. 1)

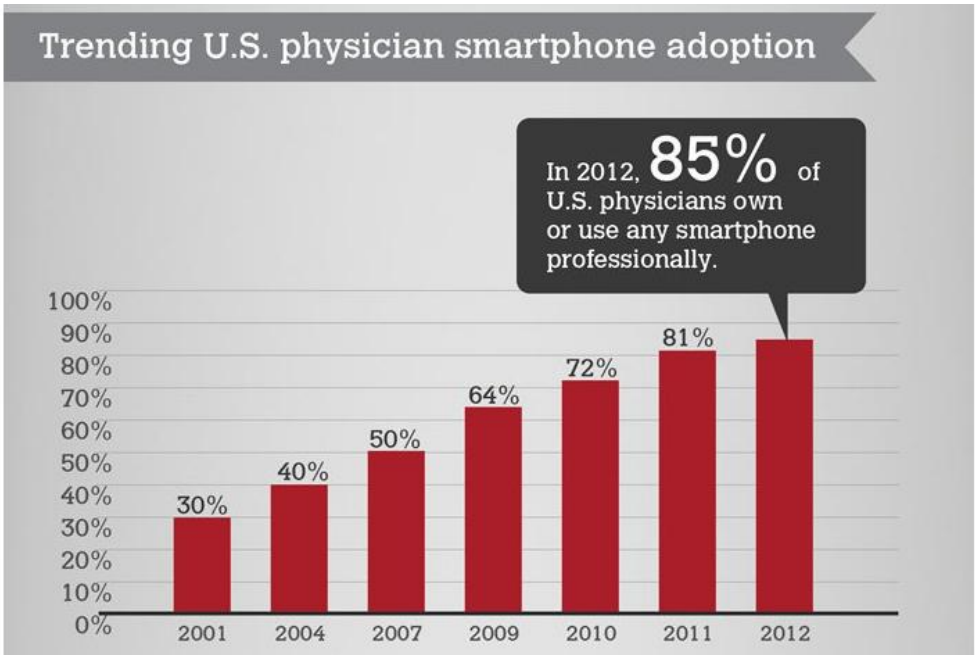
The increase in expenditures has created a natural focus on cost saving and optimisation, but it is though necessary take into account, the possible growth in innovation and technological development, which might be interlinked with growth in expenditures; US is very high in both estimates (Grebel, 2011, pp. 2-3).

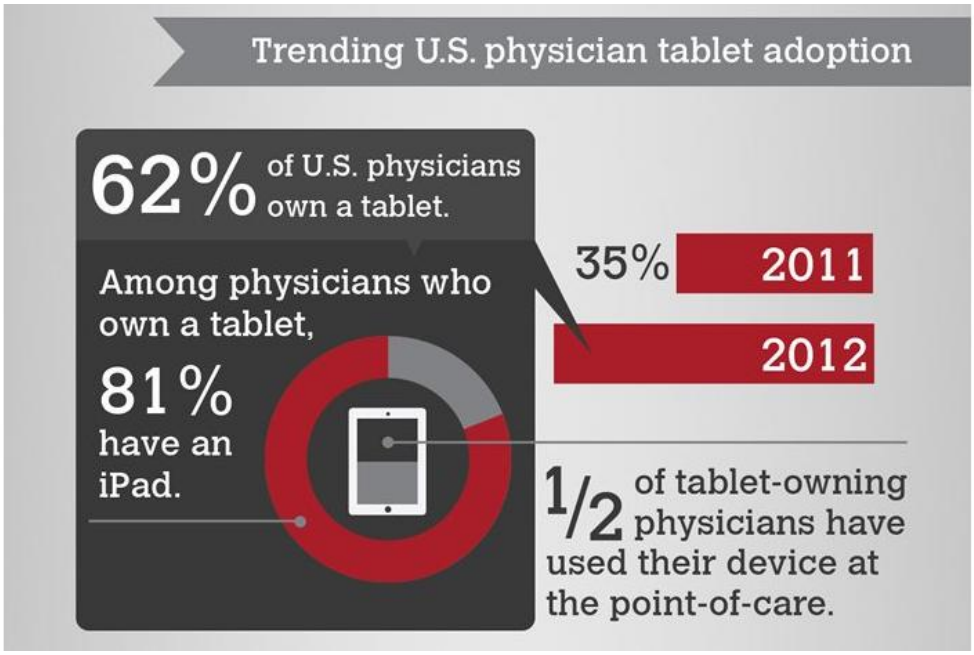
A new branch of technological development is now entering the healthcare sector, which might change the usual link between technology in the healthcare sector and high developing costs. The rise of mobile technologies greatly extends the possible interaction with patients, a fluid flow of data and devices serving multiple purposes. One indicator of the so called mHealth industry as both relatively new and in a drastic expansion, is the fourth annual *mHealth summit*, which was held for, in the December 2012. Expectations for the 2013 event are high, since they reach an impressing number of approximately 4,050 participants from 56 countries, and 300 exhibition companies

[1] Gross domestic product

(mhealthsummit.org A), as well as representation from 50+ different universities, primarily from the American continent (mhealthsummit.org B).

Another more concrete indicator is the market research study done by Manhattan Research, including 3,015 practicing physicians, which found the following continuous development of the adoption of devices in a professional setting:




Screenshot from: manhattanresearch.com

Although not as profound yet the Danish healthcare industry is also evolving at that direction, a clear indicator of how it might challenge work procedures and even legislation, surfaced in a recent debate about issues in the Danish model, holding back the development and implementation. The issue concerned the fact that a part of the budget to each Danish hospital is related to the number of patients treated, but "home treatment" is counted in. This is an unnecessary hindrance to otherwise more efficient setup, when possible. The political response was therefore also surprisingly simple; the responsible minister, Astrid Krag, fully admitted the disadvantages and promised to deal with the problem trough an adaption of the model. (Computerworld.dk) The need for a change in the legislation is here regarded as a strong indicator of the underlying potential of development in the field.

It is within this highly relevant setting that my master thesis takes it starting point, after acquiring an unique access to an newly established developer of applications (apps) to the health care sector. The firm (AppCare), is part of an EU-supported programme labelled "GameLab4Health", which involves Odense University Hospital, private partners (including AppCare), technology suppliers and regional education institutions. (gamelab4health.dk A) To exploit the possibilities in this recent development and to ensure a healthy regional development is the core of the gamelab4health programme.

In regard to the quantitative figures of the U.S. healthcare sector, Odense University Hospital has 11,000 devices across the organisation (gamelab4health-kickoff), compared to approximately 9,500 healthcare professionals (ouh.dk 2).

To both ensuring the use of the newest technologies and trends, as well as attend to the second purpose of regional development, private partners is intimately involved in the programme. As stated above, it is one of these private partners, which I have acquired a special access to; and the study's research question is therefore as following:

## 2. Research question

*What can we learn about facilitating innovation and entrepreneurship in the Danish healthcare sector? - Illustrated through the case of AppCare.*

## *2.1 Delimitations.*

Due to the extensive use of the word “project” when describing the case of AppCare and their surrounding ecosystem, this master thesis will be referred to as “the dissertation/this dissertation”. An additionally distinction between project and programme will be made in the beginning of chapter 4 setting the stage.

When working on the aggregation level of the gamelab4health and APPlied Health *projects*, they will be referred to as *programmes*, with specific projects within them. This is an important notion since they are officially described as “projects”, but since they have the role of an “umbrella” with separate partners attached to each subproject, they are rephrased to ease the understanding and give a clearer description.

## *2.2 Point of access*

Regarding the scope of the inquiry one should keep in mind that my point of access goes through a personal contact in AppCare (Harald R. Tokeroed), and projects developed by other, independent firms will therefore not be part of the investigation. It is important to remember that although terms like collaboration and openness are used, confidentiality between the contact person at OUH and AppCare are exercised in the process, when it comes to current work, concrete content, drawings etc. For 95% of the instances this does not include strategic core business information that would prevent me from mentioning it in the dissertation, but rather information not to be disclosed while contemporary.

# 3. Methodology

In this third chapter, the research question will be used as a guideline through the choice of methodological approach, and considerations about how to conduct the chosen study.

When conduction research it is always important to lead the research question guide the choices about method throughout the study. (Tanggaard & Brinkmann, 2010, p. 37)

## *3.1 Choice of research method*

The cornerstone in every social science research is the choice and execution of a research method; linking a well-argued research question to a valid and reliable conclusion, through the collection and analysis of relevant data. Where to incorporate theory varies greatly amongst approaches, from the deductive hypothesis testing to the inductive approaches like grounded theory.

In this master thesis, a case study approach is chosen, and despite the fact that it is a broad and varied approach in itself. For guiding the methodological decisions, the much used framework of Robert K.Yin (2009) is chosen because of its unique combination of reflections about the case study research in general, and practical guidance to the researcher about to commence. "*Other texts do not offer this same combination.*" (Yin, 2009, p. ix)

As stated in the former chapter, the research question for this master thesis is:

> *"What can we learn about facilitating innovation and entrepreneurship in the healthcare sector? - Illustrated through the case of AppCare."*

The following chapter will argue for the choice of a single case study approach, define its unit of analysis, and discuss central terms like validity and reliability in regard to this.

## *3.2 Why AppCare?*

As described in the introduction, AppCare is positioned in the midst of the promising new industry of mHealth, with a direct link to a major client in the Danish healthcare sector. Although the programme was initiated some time ago, the official kick-off was held the 11th of February 2013, hence a perfect timing for this master thesis to follow a case of big potential of innovative solutions to the healthcare system. The aim of the master thesis is therefore to perform an in-depth case study, leveraging the unique access for me as a researcher to a key player in the complex, network of

actors surrounding the case of AppCare – which gives me a unique chance of investigating, ongoing collaborative innovation efforts from the inside.

### *3.3 Why case study research?*

When deciding which kind of study is most appropriate for the investigation, it is important to note that the distinction between research approaches is not always clear and unambiguous (Yin, 2009, p.8). To make a qualified choice, Yin (2009, p. 8) presents a list of three core conditions or questions to be answered, which are marked by numbers in the following model.

| Conditions / Method | (1) Form of Research Question | (2) Requires Control of Behavioral Events? | (3) Focuses on Contemporary Events? |
|---|---|---|---|
| Experiment | How, why? | Yes | Yes |
| Survey | Who, what, where, how many, how much? | No | Yes |
| Archival analysis | Who, what, where, how many, how much? | No | Yes/no |
| History | How, why? | No | No |
| Case study | How, why? | No | Yes |

*Yin (2009, p. 8), Relevant Situations for Different Research Methods*

The first condition is the very *form* of the research question. At first, it might seem as the simplest task of the three, but when going into the meaning, definition and consequences of the words, one might argue the contrary. To rephrase, the chosen research question is formulated as following:

> *"What can we learn about facilitating innovation and entrepreneurship in the healthcare sector? - Illustrated through the case of AppCare."*

It is important to note, that this model do not force the investigator to choose a specific word, but instead apply critical, thorough considerations about the *kind* of question asked. To stress this, Yin (2009, p. 9) distinguish between with two kinds of "what's". The first "what" tries to *explore*, as Yin (2009, p. 9) exemplify: "*What can be learned from a study of a startup business?*", which is very much in line with the research question of this master thesis. Here an explorative study is most

suitable, and can be conducted within any of the five approached, depending the other characteristics. In contrast, the second "what" has a more quantitative focus on "who, "where", "how many", or "how much". All questions that would be best investigated through survey methods or archival analysis. (Yin, 2009, p. 9)

When turning to the "how" and "why" questions, the research is likely to be more explanatory, and facilitate experiments, histories, or case studies. This is because the focus is shifted towards the reason behind, and the investigator tracks the links over time, instead of counting frequencies and incidences. (Yin, 2009, p. 9) To further elaborate the characteristics of this approach, investigating "how many" participated in a given programme, or what benefits they received could be performed without the case study approach, while "*... if you needed to know "how" or "why" the program had worked (or not), you would lean toward either a case study or a field experiment.*" (Yin, 2009, p. 10).

When using these distinctions, "*how*" refers to the quest of investigating how things are done, and I would argue that this would lead to the obvious purpose of gaining knowledge of *what* can be learned.

The second condition to be considered is whether the investigation has access to and control over the behavioral events under study (Yin, 2009, p. 11) Whereas history obviously has no access since what is investigated happened in the past, and "*... no relevant persons are alive to report, even retrospectively, what occurred ...*" (Yin, 2009, p. 11). Sources of information are therefore limited to written materials (primary and secondary), as well as social and cultural artifacts. (Yin, 2009, p. 11)

The third condition is about whether or not the study is about a contemporary event. To conduct a proper, rigorous, case study, the researcher also needs to draw on existing knowledge like the history approach, but the investigation adds another, contemporary element of direct observations and interviewing relevant people. On the other hand, what clearly distinguishes the case study approach from experiments is whether the investigated events can be manipulated, as one would do in a systematic way in the latter approach. (Yin, 2009, pp. 8, 11)

From this description, it is clear that although the type of research question asked is not a clear "how" or "why", the purpose is still in accordance with this approach. Although through explorative aspects of, the study do indeed deal with very contemporary events, in which no opportunity of

systematic manipulation is present. With that said, the researcher cannot be a passive observer in this approach, and considerations about my role as a researcher will be discussed in section 3.4 and 3.5.

Yin (2009, p. 3) stresses that a case study should always be guided by a research question, which originates from a thorough review of relevant literature. To further guide the researcher in the right direction, Yin (2009, p. 28) proposes that the researcher makes study propositions. However, sometimes because of the types of the research it is legitimate to not make any formal propositions. This is for example the case when the study is of an explorative nature; some focus is needed in the inquiry to guide the data collection. (Yin, 2009, p. 28) As this research is an explorative one, there are no direct study propositions, however, the study is guided through the research question.

### 3.3.1 A definition of a Case Study

When defining what a case study encompasses, Yin (2009, p. 18) stresses the two main characteristics of the study to be, an empirical study that "*... investigates a contemporary phenomenon in depth and within its real-life context, ...*" and therefore "*... relies on multiple sources of evidence, with data needing to converge in a triangulating fashion, ...*" (Yin, 2009, 18)

It is here very important to note that although the case cannot be investigated without understanding its context as well; drawing a clear distinction between the case and the context is a vital exercise to perform, since it will greatly affect which data is relevant to collect. This is the purpose of the following subsection.

### 3.3.2 The unit of analysis.

As Yin (2009, p. 29) argues, it is a commonly source of struggle for researchers to properly define their unit of analysis and it can indeed involve many different entities. As examples, Yin mentions as diverse "units" as an *individual*, a; *specific group*, *decision*, *program*, *implementation process*, and *organizational change* (Yin, 2009, p. 29). Defining the unit of analysis, help guide the researcher from the research question towards what sources of information are relevant.

The challenge of identifying the unit of analysis, specific to the case-study approach, is that it is closely interlinked with the context in which it is located. To exemplify this intertwinement, Yin (2009, p. 31) refers to a study in national policies affect on the business environment, in the following example:

> "*Two of the cases appear similar but in fact have different main units of analysis. One case, about the Korean firm Samsung, is a case study of the critical policies that make the firm competitive. Understanding Korean economic development is part of the context, and the case study also contains an embedded unit – Samsung's development of the microwave oven as an illustrative product. The other case, about the development of an Apple computer factory in Singapore, is in fact a case study of Singapore's critical policies that make the country competitive. The Apple computer factory experience – an embedded unit of analysis – is actually an illustrative example of how the national policies affected foreign investments.*" (Yin, 2009, p. 31)

In accordance to this, my aim is to utilise the AppCare example to shed some experience-based light on the current state of OPI in Denmark, through working in-depth with the case of AppCare, resulting in conclusions about how the OPI framework affects this particular setting. It is therefore a case study about stimulating innovation and entrepreneurship in this specific sector, analysed through the case of AppCare (i.e. unit of analysis).

As it appear in the description of the case, AppCare operates within a network of partners in the gamelab4health programme, which together with the client Odense Universitetshospital (OUH), make up the main context of the case. The two founding companies of Human Cap and AppFactory were also important to encompass in the researcher's understanding of the field, since they clearly guides the structure of AppCare (as will be elaborated). But understanding the potential in the case, without regarding the Danish healthcare sector, and the potential of using mHealth would not have been productive either.

### 3.3.3 The single case design and its rationale

If the choice between single and multiple case study is completely free to make (which it seldom "the case"), Yin (2009, p. 53) refers to the general (quantitative) perception that the evidence from a multiple case study is viewed more compelling because this type of study is would be viewed more robust as a whole. Though, as it should appear in the following discussion the choice between single or multiple is more a matter of making a fit between the goal, the means and the specifics of the inquiry. Yin also adds a more practical consideration, about the researcher should be very realistic as "*... the conduct of a multiple-case study can require extensive resources and time beyond the*

*means of a single student or independent research investigator. Therefore the decision to undertake multiple-case studies cannot be taken lightly*." (Yin, 2009, p. 53). Making a realistic design and completing the study in proper manor, will also reflect on the results.

In the case of AppCare, one might argue that including similar involved private partners in a multiple case study would have strengthened the basis of the investigation and the degree of generalisability. But it is important to keep in mind that these "other private partners" are direct competitors to AppCare and vice versa, and obtaining genuine, in-depth information about core business functions, might have been a whole different matter. So, in a similar setting where the researcher *did not* have a special access to the field, this might have been an interesting approach, either conducted in a more superficial way, or by a group of researchers. Further reflections on this relation between the researcher and the field, is provided in section 3.4.1.

When deciding to perform a single case study, and of which type, it would be beneficial to refer to the often used rationales for choosing this approach; and critically reflect about if this apply in the forthcoming investigation.

To do so, Yin (2009, pp. 47-49) presents the following five rationales;

- The *critical case* is a deductive way of testing a given theory, through explicitly stating a set of propositions and in which circumstances they are expected to be true. If one manage to verify the applicability of the given case, the results can be related directly back to the tested theory and either "*... confirm, challenge, or extend the theory*." (Yin, 2009, p. 47) One must though remember the inherent problem that, it only takes one black swan to disprove the proposition that all swans are white; but only finding white swans do not deliver the same level of certainty. (Flyvbjerg, 2008, p. 172)
- The second rationale one might have is when the case represents an *extreme* or *unique* situation. This situation applies when a rare event occurs, and multiple cases are therefore not even an option. These case studies can shed light on events not otherwise understood, and slowly build our knowledge of the phenomenon (Yin, 2009, p. 47).
- Thirdly, one might be well served with a single case study approach in situations where the case can be argued to be a *representative* or *typical* case. "*Here, the objective is to capture the circumstances and conditions of an everyday or commonplace situation.*" (Yin, 2009, p. 48). The

case may represent a typical firm or project in the given industry and the learning output is assumed to be informative for others in a similar situation.

- A *revelatory* case study is preferred when the investigator obtains the opportunity to study a phenomenon not usually accessible to science, although the phenomenon might be widespread (Yin, 2009, p. 48). In these circumstances, purely describing the obtained information can be revelatory, and prove valuable to the understanding of the phenomenon.
- Last but not least is the *longitudinal* approach to case study research. Here the case is followed over different periods in time, to investigate whether the phenomenon evolve in accordance to what would be expected, but also to "*... specify how certain conditions change over time, ...*" (Yin, 2009, p. 49).

Whenever arguing what is specific or particular about this master thesis, the topic of the *unique access* comes into play. It would be very wrong though, to state that the case of AppCare is a very unique case in itself, since the industry's continuous growth of app's and related solutions comes from a wide array of national and global actors. I would actually go as far as stating that when focussing directly on AppCare (i.e. unit of analysis), it is a representative one, which is especially interesting because of their participation in the gamelab4health programme. When combining the reflections on the three *core conditions* and the underlying *rationale* for conducting a single case study, the approach can therefore be specified to an explorative approach to "*... capture the circumstances and conditions of an everyday or commonplace situation*." (Yin, 2009, p. 48).

### 3.3.4 Embedded vs. holistic case study design

After deciding what kind of case study would be most appropriate to the circumstances, a further distinction need to be made in regards to the former discussion of the unit of analysis. The important distinction concerns the choice between a holistic and an embedded approach.

The *holistic approach*, describing an organisation or phenomenon as a whole "*... is advantageous when no logical subunits can be identified or when the relevant theory underlying the case study is itself of a holistic nature*." (Yin, 2009, p. 50) This can lead to lack of focus and guidance on the data collection though, and the entire focus of the case study might shift as the study progress. (Yin, 2009, p. 52)

The *embedded approach* is characterised by a design of more than one unit of analysis, hence subunits are used to divide the data collection. In this regard, Yin (2009, p. 50) fittingly refers the situation of studying "*... a public program that involves large numbers of founded projects – which would then be the embedded units.*" (Yin, 2009, p. 50) A selection process is likely to be necessary in this situation (Yin, 2009, p. 50), and in the current study that implied judging *if* to scrutinise specific projects in the AppCare portfolio, and if so, *how many*.

The choice of including particular interesting projects as embedded units of analysis was made to insure a satisfying level of depth in the analysis, and concretise questions about "how they organise" and "who they involve" in the innovation process. In the beginning of the study, it was not yet evident how big a portfolio of projects to choose from, and what they exactly where about. The study therefore went from an initial holistic approach, to focus on the two projects that developed the most; to give a better, more thorough picture of the collaboration and development process, and thereby the case. By doing so, an indirect focus on the successes and "what works" was adopted, but learning outputs from those projects which failed or stagnated will be included as well, to better complete the picture.

## *3.4 Sources of information*

The following section will present and critically reflect on the sources of information made available in the study, as well as describing the collaboration in which they were obtained. Before going into details about the extent of the collaboration, is it though important to clarify that the professional contact I have with the co-founder of AppCare, Harald R. Tokeroed.

### 3.4.1 The researcher and his contact - Characteristics of the collaboration

The relation was established during my 4 months internship at his consultancy *Tokeroed Consulting* in the autumn of 2012. It was through this contact that I discovered this opportunity in the first place, and it facilitated a high level of trust and mutual understanding from the very beginning; thus easing the start-up process and mitigating disadvantages associated with describing a case from a distance of approximately 250 kilometres.

One might fear that since the close collaboration with Tokeroed has stretch across two projects and nine months, the distinction on what information relates to which project would be blurred; but this was by no means an issue since it took place in two different organisational settings, involved

completely different themes, and was separated by the end of December and the first half of January. The contact and means of collaboration regarding this specific master thesis began back in the middle of January and was continued up until days before the submission date.

It was evident from the start, that Tokeroed would both be my contact person and a key subject of the study. Besides that, our relation and trust was a natural "door-opener" to the events as well as closed meeting in which I participated. One therefore needs to be critical about my role in the field, which might not be completely objective in the eyes of all participants. A natural balance was therefore pursued, between full disclosure to the internal partners in AppCare on the one hand, and on the other hand presenting the current role of writing a master thesis in collaboration with AppCare when participating network meetings etc. This was by no means to withhold information or having a hidden agenda, but to send a clear and unambiguous signal, which did not take away focus from the matter at hand. Yin (2009, p. 107) also describe the situation where an interviewee can assist in gaining additional access to the case, and in this process be more of an "informant" to the researcher. He further stresses that the possible benefits of guidance in who to talk to, what events to attend etc. can be of great significance by stating that "*Key informants are often critical to the success of a case study*." (Yin, 2009, p. 107). One must not be naive though, and the risk of over dependence and interpersonal influence is one to seriously consider; "*A reasonable way of dealing with this pitfall again is to rely on other sources of evidence to corroborate any insights by such informants and to search for contrary evidence as carefully as possible*." (Yin, 2009, p. 107)

This process did in fact consume a considerable amount of time, since a major part of the information obtained directly through the interaction, was later available online, through their communicational efforts; and verifying and extending the description was therefore an ongoing process, further driven by that fact that what was described evolved simultaneously.

### 3.4.2 E-mail and Phone correspondence:

Due to the geographical distance, a major form of communication was done through a vast amount of *e-mails* covering as diverse themes as:

- *Practical arrangements*; when to visit next time, what meetings or events to attend etc.
- *Exchange of written materials*; official documents, forwarding of invitations, and an exhibition video of a prototype.

- *Information about agendas and participants in meetings*; and how well the different arrangement functioned – from AppCare's point of view.
- *Regular briefings on AppCare's portfolio of projects*; what is the process, how far is it, etc. (this was a key topic in both e-mail and phone communication).

In regard to the two last points, the dynamic process of question and answers, made the e-mail correspondence positioned as something in-between a questionnaire and a computer-assisted interview. As Kvale and Brinkmann (2009, pp. 169-170) argue, phone and computer-assisted interviews is a growing practise within social science research, with its inherent pros and cons. First of all, it allows the researcher to reach people over greater geographical distances (and more often, as in my case), or people in dangerous environments like areas affected by war or disaster. (Kvale & Brinkmann, 2009, p. 169)

Depending of what kind of information is needed, an e-mail correspondence is much more flexible in both timing and overall time consumption, whereas video-transmission allows a high degree of body langue and spontaneous reactions. Since communication was conducted in the confidential setting of our personal e-mails and consisted of a mixture of personal and professional content, it is my assessment as a researcher to present the information in its aggregated form as done throughout the description of the case; while the full extent of notes and correspondence is kept for the possibility of later recaps and comparisons between acquired information and dates.

To supplement the e-mail correspondence, enable dialogue, and add depth and speed to the process, phone and video (Skype) meetings were therefore conducted on a regular basis of two-three times a month.

#### *3.4.2.1 The interplay between means of communication*

Although phone- and especially face-to-face meetings are much more information rich, and allows one to create and verify a common understanding, they are also time consuming and in regards to dealing with the busy time schedule of an entrepreneur, arranging when to call or visit, quickly becomes a prerequisite. E-mail correspondence was therefore the basis of communication and allowed the two other forms of communication to be highly efficient.

### 3.4.3 Physical meetings

Besides the interplay of different means of communication by distance, regular visits on site in Odense were made, scheduled around relevant events or meetings between AppCare and Odense University Hospital. These meetings where combined with internal briefings and discussions about the internal development of AppCare, including progress, reflections on the business model etc.

Performing interviews while also participating the social setting of the phenomenon, Yin (2009, p. 106) explains that "*The interviews will be guided conversations rather than structured queries. In other words, although you will be pursuing a consistent line of inquiry, your actual stream of questions in a case study interview is likely to be fluid rather than rigid.*" (Yin, 2009, p. 106)

It is of course always up to the investigator to judge what is most suitable in the given situation. Due to the mixture of the time schedule and the both personal and professional relation, interviews about progress, ambitions, reasons, and decisions was performed in the flexible spare time from one activity to another. In these situations, an informal dialogue was chosen to follow up on what *has* and *where* to happen.

To process the vast amount of information acquired at meetings in Odense, thorough field notes were conducted, describing everything which seemed relevant in the situation. Since the case was constantly evolving a strict focus on AppCare and its projects was combined with an open mind of what happened in the context. In the meetings between OUH and AppCare, this resulted in a situation where my field notes also functioned as internal "minutes of the meeting", by submitting them to my contact person in a process both adding value for him, as well as validity to my field notes.

In the act of participating directly in events, and thereby performing "direct observation", Yin (2009, p. 111) advises the researcher to increase the numbers of observer whenever possible to better grasp the wide array of impression and increase the reliability of what is observed. This was not an option in present study, but it was assessed that although interesting, more subtle signs like facial expression or exchanges of looks, where not as pivotal as can sometime be the case in social science. But since I did not have an active role at these events, these interactions where not ignored either. With that said, a situation need not be all that subtle to be perceived differently by two people and the general outcome from the "direct observations" where to some extent balanced of against the perception of my contact person and my other sources of information. This might not

always be a desirable solution when designing field work, but with the practical nature of much of the information (what have we learned from the focus group? how to proceed? etc.) it was assessed as a productive and suitable solution.

### 3.4.4 Field procedures

To be able to fully exploit the unique situation surrounding this investigation, prioritising participation and involvement in "the field" was regarded as a main source of information. A case study's focus on social complex events, participating in the phenomenon to be described, brings it close to the approach of field studies. This close relation is also portrayed in practical orientated "*On the Art of Doing Field Studies*" – handbook by Andersen (et. al., 1995) of doing field studies. By defining field studies in the broad terms of "*... exploration of complex, social, empirical phenomena – either contemporary or historical – by applying multiple sources of data.*" , they even goes as far as equate the one with the other; "*This definition is close to Yin's (1984:23;1991) definition of case study research, and we have chosen to view case studies and field studies as synonymous*." (Andersen, et. al., 1995, p. 22)

Whether synonymous or not, it is therefore not surprising that Yin (2009, pp. 83-86) devotes a section to "field procedures", providing the budding researcher with practical guidance of how to proceed.

When conduction data collection "in the field", as done in this master thesis, with physical meetings and participation in related events, one must keep in mind that it is different from e.g. a structured interview. Yin (2009, p. 85) goes as far as stating that it is "*... an entirely different situation*." in regards to the control over the data collection activity. Amongst other things, he mentions the challenge of adapting to the interviewee's schedule and availability, as well as respecting the fact that you as a researcher are "*... intruding into the world of the subject being studied rather than reverse*;" (Yin, 2009, p. 85).

To deal with this challenge of interaction, Yin (2009, p. 85) presents the following list of practical and methodological preparations, "*coping behaviour*", to consider before entering the field.

- *"Gaining access to key organizations or interviewees;"* (Yin, 2009, p. 85)

- From the very start, I had a direct connection with one of the key persons in AppCare, and was introduced to the rest of "the context" during the regular meetings in Odense. Knowing beforehand what the purpose of the meetings was, and the main participants, greatly helped in the double process of noting *who* participated in what way, and the *content* of the meeting.

- *"Having sufficient resources while in the field – including a personal computer, writing instruments, paper, paper clips and a preestablished, quiet place to write notes privately;"* (Yin, 2009, p. 85)
  - During my visits in Odense, intentionally spent a whole day or two, to maximise the output of the trip. Idle time between meetings/events was therefore anticipated and bringing my personal computer an obvious choice. Writing, rewriting and expanding field notes, alongside with regular project work was conducted in these periods, located at Human Cap's office space, where desktop, wireless internet and sufficient privacy was available. To assist the process of taking notes "in the field" I used a combination of the old style paper and pen, and an iPad. From my experience, the researcher should always strive towards reflecting his surroundings, since "showing of" could draw unnecessary attention away from the topic. But since these were technology-friendly environments (they are producing apps after all), it is my assessment that this issue did not appear. Paper and pen was preferred at one large meeting in the Gamelab4health programme, since I knew from the start that I was mainly going to listen, using paper more clearly sent a message that I was engaged and interested in contrast to using an iPad where people don't know if you a listening - or checking e-mails. I therefore strongly concur that a broad variety of tools is preferred.
- *"Developing a procedure for calling for assistance and guidance , if needed, from other case study investigators or colleagues;"* (Yin, 2009, p. 85)
  - This was not regarded as necessary, since major ethical dilemmas was neither expected nor incurred.
- *"Making a clear schedule of the data collection activities that are expected to be completed within specific periods of time;"* (Yin, 2009, p. 85)

    - As mentioned in the second point, meetings where arranged well in advance in regards to meetings, events and interviewing key persons. Idle hours in between where kept flexible, but the time schedule was otherwise rather strict.
- *"Providing for unanticipated events, including changes in availability of interviewees, as well as changes in the mood and motivation of the case study investigator."* (Yin, 2009, p. 85)
    - Additional time where often build into the schedule from my point of view, allowing for imitate reflection, as well as the abovementioned informal interviews. Postponing work a day or two was obvious not an option with limited time and trips to Odense, but an open, friendly atmosphere mitigated pressure of work, hence avoid this pitfall.

As indirectly shown in the run-though of the "coping behaviours", knowing these precautions in advance, combined with my continuous reflections, greatly facilitated a focus when participating in the quite pivotal events of visits in Odense.

### *3.5 Research ethics, confidentiality, and my role as a researcher.*

Whenever interaction with the every-day life is made, and especially when it involves the livelihood of the subjects, reflections about ethics is an important task to do. Although one should always strive towards high ethical standards, Yin (2009, p. 73) stresses that this especially important in the case study approach, since it involves people in contemporary events. An uncritical portray may have consequences of persons involved.

When commencing the study, I was assured that although I possessed a direct line of information through my contact person, none of the information was confidential or inaccessible as material to my master thesis, unless it was explicit stated as such.

To participate in the every-day life events, in a non-suspicious way, it was both expected and experienced that clearly communicating who I was (in the professional setting) and why I was there; was a critical initial step to be involved in the process.

It is important to remember, that when introduced to a setting by someone (like my contact person), your actions will to some extend reflect back on him. Being interested, engaged and open-minded is therefore more than an act of normal courtesy. Additionally, second guessing your contact person

might compromise his position in the context, and would by no means be productive nor acceptable behaviour. This is not the same as removing critical reflections and confronting contradictions, but the way it is conducted can have great, long term consequences on the affected.

## *3.6 Judging the Quality of Research*

### 3.6.1 Validity

When describing the quality in a case-study research, Yin (2009, p.41) puts great emphasis on testing the degree of validity. Before going into this in greater details, it is helpful to clarify what exactly the term validity refers to in this, qualitative research project. At it very core, validity is about ensuring that you actually investigate, what you claim to do (Kvale & Brinkmann, 2009, p. 278), and in this sense, can draw the conclusions you do. This is in fact very much in line with the former discussion about the issue of distinguishing between *the case* and *the unit of analysis* (Yin, 2009, pp. 29-32), and making this distinction clear, facilitates the process of validation.

For the purpose of explicit reflections about the quality of research, the follow subsection is divided into parts according to Yin (2009, pp. 40-44) framework.

#### *3.6.1.1 Construct validity*

The constructed validity covers what was just defined as the overall view on validity in social science. It is about using definitions and delimitations to assist the researcher in actually investigating what is claimed to be investigated i.e. the case - and not some related, although interesting, events in the context. (Kvale & Brinkmann, 2009, p. 278; Yin, 2009, p. 42) Achieving this, will of course have major positive effects on the conclusions drawn.

Going into more specifics, Yin (2009, p. 41) presents three tactics dealing with this challenge, whereas multiple sources of evidence is important to verify what is observed, an establishment of a clear logical chain of evidence from what is observed and how it is analysed and reported, as well as having a " ... *draft for the case study report reviewed by key informants*... ". Using multiple sources of evidence has been a main priority from the start, to verify my perception of things, realising that "what is relevant" might be judge differently, as well as checking whether things had changed as a natural effect of the contemporarily circumstances. Keeping a strict record of what information was relevant to what embedded unit of analysis was also very critical to avoid

information overload, and was done through an expanding set of labels or "codes" in the field notes (in broad sense), as well as explicit questions to what a given information was related – acting slightly uninformed whenever in doubt. Both critical notes as well as the full extent of the final case description was reviewed by my key informant, to ensure that no main points where left out, or information misplaced.

#### *3.6.1.2 internal validity*

Another aspect commonly address in the case study approach, is the internal validity. This is a core element in *explanatory* or *causal* studies, which builds on strict propositions between theory and the case. This is not applicable descriptive or explorative case studies (Yin, 2009, p. 40), although the sub-category of *inference* has. The issue of inference arise every time an event cannot be directly observed, and therefore has to be described through the other means of inquiry. This might always be a present issue, and was of course a given in the present master thesis, since the inquiry was conducted over a significant geographical distance. To ensure as rigorous and precise collection of information, multiple sources of evidence played a vital role, as well as restating questions whenever doubt occurred.

#### *3.6.1.3 External validity*

The discussion of external validity relates to the fundamental distinction between analytic and statistical generalization (Yin 2009, 43). In a case study research, cases is always picked with great care to ensure a viable study approach, they represents an opposite to the randomly chosen sample in much statistical generalisations, which aims at concluding something general about a whole population. The analytical generalisation requires a theoretical starting point, of which "... *previously developed theory is used as a template with which to compare the empirical results of the case study."* (Yin, 2009, p. 38) Whether the aim is to actually test the theoretical framework, or further expand it and inform further research is depending on the rationale and design of the study as described throughout this chapter. This study has the purpose of informing further research, through its explorative nature.

### 3.6.2 Reliability

To be able to deliver reliable results is an act of clarity and thoroughness thorough the study and the study report. The overall goal is to avoid errors and biases in the study (Yin, 2009, p. 45). The aim

is to hypothetical enable another researcher to conduct the same case study over again; "*not ... "replicating" the results of one case by doing another case study*." (Yin, 2009, p. 45) What makes me stress that this would often be a hypothetical possibility, is the fact that the events are contemporary in general, and in this study in particular. I therefore add a dimension of describing the process as precise and *reliable* as possible, a approach uncommon in the quantitative social science, where others goes as far as denying the premises of validity and reliability (Kvale & Brinkmann, 2009, pp. 270-271).

### *3.7 Project design*

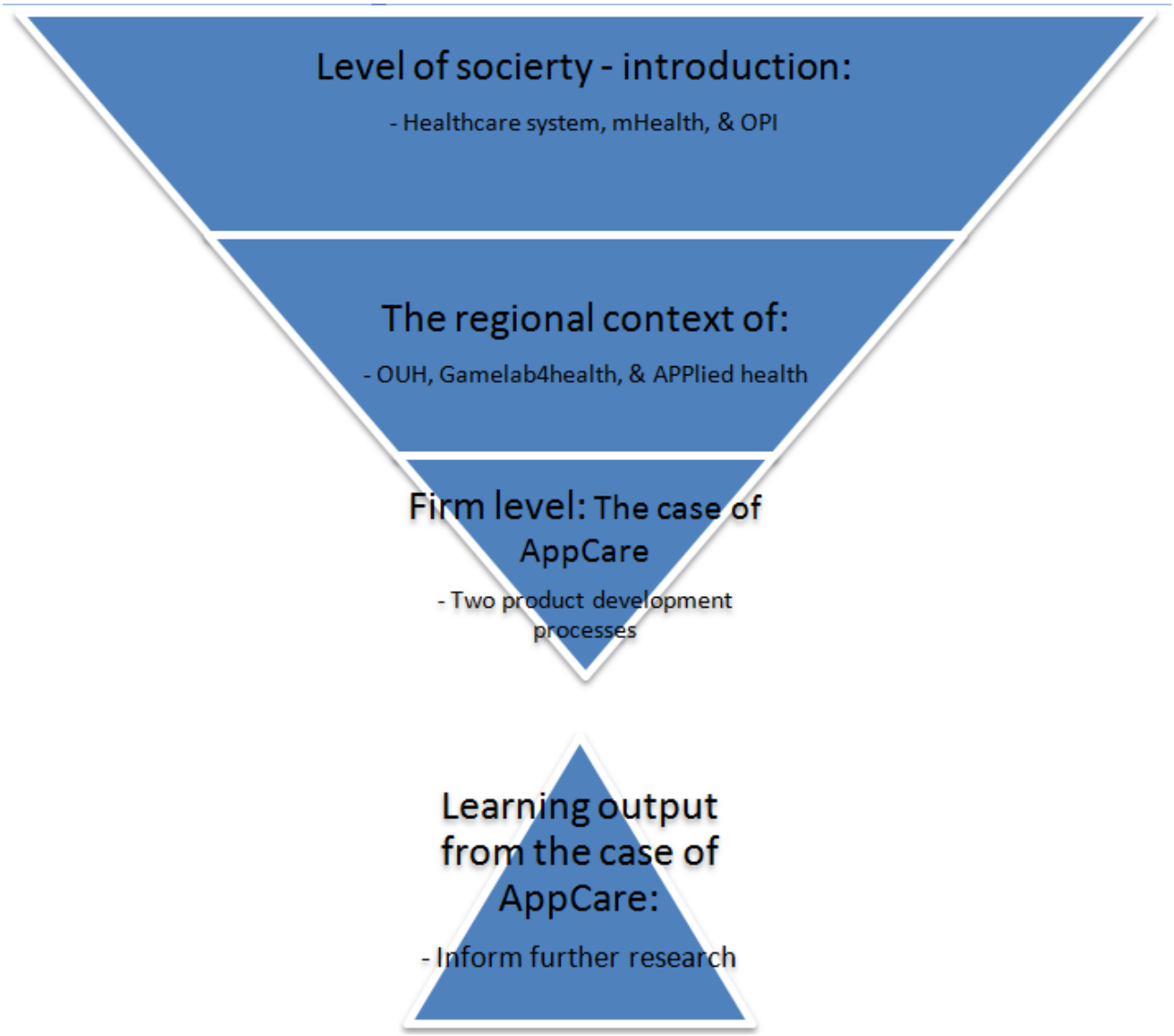
The following section has the purpose of clearly guide the reader through the rest of the case study report, to enable a better understanding of the whole, knowing what to generally anticipate in the forthcoming chapters.

The introduction guided the reader from the level of society, through the leading regional actors and the relevant EU-supported program towards the firm level and explained briefly the unique and interesting case at hand. To proper focus the investigation, a research question was put forward, which guided firstly the methodological reflections and through that, the rest of the inquiry.

In the methodology chapter, the specifics and characteristics about the chosen case study approach is being scrutinised. To conduct a reflective choice of which approach to follow, the much cited framework of Robert K. Yin (2009) was chosen, which enabled me to draw on a productive combination of reflections about the case study research in general, and practical guidance to the researcher about to commence.

To fully appreciate the explorative nature of the study, a careful description of the case will succeed this chapter on methodology, before leading on to dynamic presentation of theory and analysis. This is first and foremost done to assist the reader in understanding the specifics of the case, as well as enabling a better flow in the reading experience. The actual process of inquiry has of course been much more overlapping in this regard, as also stressed by Yin (2009, pp. 3, 37) the theoretical framework should have an guiding effect from the very start, in verifying a relevant research question, defining the unit(s) of analysis and drawing implications from the study.

### 3.7.1 The structure of the study



# 4. Setting the stage

The following chapter will present the major actors in the business environment that AppCare is positioned within. This is especially relevant since the "core collaboration" between AppCare and OUH is organised in a network approach, where a typical meeting or event is attended by multiple stakeholders.

## *4.1 The context of OUH and the two EU-supported programmes "gamelab4health" and "APPlied health".*

Odense University Hospital (OUH) is the central actor in the two related programmes "*gamelab4health*" and "*APPlied health*", whereas the former is the one AppCare is involved in. Within the organisation of OUH, the programme is lead by the "*lean & innovation*" subsection of "*operations optimisation & IT*" (DoIT) (cf. appendix #1). As the central driver, it is OUH who applied for funding to the gamelab4health programme, and has the managerial responsibilities of ensuring private partners and educational institutions to complement their direct access to patients in need. The responsible person for securing and managing the programme is also AppCare's contact person, which ensures a good access and relatively low degree of bureaucracy in the collaboration.

The declared goal of DoIT is to be "*... leading within implementation of it-based solutions, which supports digitalised and effective working procedures.*" (my own translation) (ouh.dk 1). A focus directly linked with the purpose of both the gamelab4health and APPlied health programmes, which will be elaborated in the following.

### 4.1.1 Gamelab4health

The gamelab4health project is about leveraging direct access to the healthcare system and the ever-growing development and expanding opportunities within "serious games" and mobile and tablet applications. (gamelab4health.dk A) The combined gamelab4health programme has an 11 million

kr. budget provided by the *European Social Fund* and *European Regional Development Fund*[2], through a local "growth centre[3]". (gamelab4health.dk A, gamelab4health-kickoff)

The involved partners can be described in three groups, with OUH in the centre. AppCare is within the group of 20 *regional IT-suppliers* described as partners. This is a broad group of private companies and regional educational institutions, working on the different solutions, which are within the theme of "serious games" and apps to Smartphones and tablets. To support this development, the project has *high-tech suppliers* being Microsoft, Apple, Samsung, giving access to a limited amount of hardware products to test the different prototypes on. (gamelab4health.dk A, meeting at OUH)

As the title of the programme indicates, is the ambition to establish a physical "laboratory" at OUH where healthcare professionals can come by with their ideas, challenges and needs. The actual setup of this "AppLab" is still not decided, but the purpose is to bring healthcare professionals and private developers even closer together, in a way that accommodates the busy daily schedule of the employees at OUH.

The various projects are to be tested and implemented at OUH if successful, and thereby contribute to the strategic focus of the *operations optimisation & IT* section at OUH. The private partners keep the legal rights to the solution, and after this final testing, they can start scaling the solutions to the rest of the industry.

The work is split up into two parts; three predetermined projects that were already commenced before the official kickoff event (11th of February), and chosen on the basis of their big potential of scalability, as well as an early spotted need. (gamelab4health-kickoff) AppCare is developing one of these predetermined projects, the one called "KOL-app". The name originates from the Danish abbreviation of the Chronic Obstructive Pulmonary Disease (umbrella of chronic lung disease, COPD[4]). The two other projects are developed with separate private firms, and will not be further elaborated. The second part is relevant when the physical AppLab has been established, and diverse, interdisciplinary groups can be formed around the ideas and problems dealt with in the lab. This is an ongoing process to find both a feasible location and setup of the lab, but the work is

[2] Da: Den Europæiske Socialfond og Den Europæiske Fond for Regionaludvikling. For more information please visit: http://ec.europa.eu/esf/home.jsp?langId=en or http://ec.europa.eu/regional_policy/thefunds/regional/index_en.cfm
[3] Da: Væksthus (promotes and stimulates the regional industry)
[4] The Danish abbreviation KOL will be used in the rest of the dissertation, since it gave name to the app.

expected finished before the summer break (approximately in the beginning of July). Exactly how that is going to be organised is still not clear, but there will be funding available to release key healthcare professionals from everyday work tasks and allow them to focus on promising projects when they require so. The actual setup will of course vary for each project, but legal rights will have to be negotiated since the ideation process is intended to be as open as possible.

The initial work done on the predetermined projects all followed the same overall procedure depicted in figure 4.1 (appendix #2), thus also describing how the KOL-app was commenced.

*The model is based on a presentation by the contact person at OUH, Jesper Lakman, at the kickoff event the 11th of February 2013. (gamelab4health-kickoff)*

To add additional depth of knowledge and creativity, local educational and research institutions are also attached to the project and attend relevant meetings and workshops; in particular researchers working on related technological fields where synergy might be achieved. Students from regional educational institutions were involved in the third stage of the model, taking part in a large interdisciplinary workshop. Besides that, they are primarily attached to the related "APPlied health" programme (cf. section 4.1.2) but can come more into play when the actual lab is established at OUH.

#### *4.1.1.1 Educating the network.*

Besides collaborating with different partners on the various specific projects, OUH is also hosting six events during the spring of 2013, which is open for all involved in the project with the aim of sharing specific, industry-relevant knowledge and practises (gamelab4health.dk A). The events cover the themes of *the industry and doing business within it*, *clinical testing*, *technology assessment*, *gamification*, *product intelligence*, and finally, *trends within gaming*. (gamelab4health.dk B) Besides enabling the partners to meet industry standards and requirements, these events also serve to extend interaction among participants and thereby strengthening and maintaining the network.

### 4.1.2 APPlied Health

This related project is described because it has a high degree of overlapping partners and (from AppCare's point of view) serve as a way of expanding the network and leverage the ideation process. The APPlied Health project is a small part of the "*Interreg 4A*"-program between *Syddansk Universitet* (*SDU)* and *Schleswig-Holstein K.E.R.N.*, with the main partners being the university hospital in Kiel and Fachhochschule Kiel on the German side, and Erhvervsakademiet Lillebælt EAL and OUH on the Danish side (*APPlied health-kickoff*).

The main purpose of the programme is to investigate different technological possibilities, and make "mock-ups" (rough demos) with the students from respectively EAL and Fachhochschule Kiel (progress so far, was presented at the kickoff event). The programme focuses on applications, whereas two similar projects within *interreg 4A* focus on robotics and serious games respectively. The APPlied health programme does not involve private partners (in contrast to gamelab4health), but "only" public educational and healthcare institutions, although spin-offs from the student project groups are allowed and welcomed to commercialise their work. At the time of the official kickoff event, one Danish group had already done that. (*APPlied health-kickoff*)[5]

As argued in the beginning of this section, this programme serves as a network opportunity and source of inspiration and AppCare's official relation is also described as such; "additional network partners"[6], which is a list of 31 Danish and German actors (interreg4a.dk).

## *4.2 The case of AppCare*

AppCare was formed to address the very specific business opportunity of being partner in the "gamelab4health" project. In order to do so, a joint venture was formed between AppFactory and HumanCap who has strong potential in complimenting each other. It is also relevant to note, that the founders had worked together at previous occasions and were therefore able to build on a mutual trust. The fact that AppCare was founded as a response to the Gamlab4health project, explains why the name AppFactory appears on the official list of partners, which has no practical implications.

[5] For further information please visit: http://appliedhealth.eu/ or https://www.facebook.com/appliedhealthchannel
[6] The relevant name on the official list is "AppFactory", because of the time difference between the *project application* and the *foundation of AppCare*, this has no practical implications.

AppCare's homepage is still only half finished, but from my visits and continuous contact to co-founder Harald R. Tokeroed I know that the structure reflects the two partners in the joint venture. Human Cap owns half of the company and is responsible for market research, marketing, conceptualising and scaling the solution. To do so, they are represented by Tokeroed as managing director and Thomas Andersen who is responsible for business development and acquiring finance when scaling the solutions. App Factory owns the other half and their founder Søren Kleberg is the technical director in AppCare, which entails the technical, programming responsibilities together with Christian Tvede who is an experienced project manager. It is especially Tokeroed and Tvede who is present at as many meetings as possible, while the technical director attends when relevant. To further strengthen the team, a programmer is doing an internship looking into the different technical developments going on, and a student helper is attached. As the first projects come close to commercialisation, more people are attached on a continuous basis.

Located at the same premises as Human Cap, AppCare is not incurring additional renting cost for office space, and working hours are covered by a two-string system of respectively project and interest level. After a specific project is agreed with OUH, all work performed on that project is billed directly to the project coordinator at OUH, this include time spent on implementation and training of the ones who are going to use it. In contrast, all of the initial work done before a project is official, is billed *internal* as interest level, and covered after a successful commercialisation. The fact that the KOL-app was one of the predetermined projects and thereby official early on, means that the risks encountered are relatively low and predictable, although the substantial economic outcome is related to an expected successful scaling of the projects.

AppCare is still evolving as a firm, and the following description of how they do business should therefore not be seen as a final model, but as the most fitting at the moment. On top of that, the work performed in AppCare all related towards the different projects with the gamelab4health programme; and variations and adaptations towards each specific solution is therefore both desired and required. With that said, is a typical procedure for AppCare, working on projects within Gamelab4health described in Appendix #3: the AppCare model.

Whenever the model refers to OUH, it refers to the contact person Jesper Lakman as a minimum, and more often the project coordinator and two representatives from the IT operations also participate.

“Low hanging fruit” refers to the principle of engaging in the viable projects that is perceived rather straight forward or quick to complete.

The part of the second meeting where the project has to be defined in content, needs, and goals is a quite pivotal point, since approval of the given project will be the official “go ahead”, enabling AppCare to bill working hours and other expenses to that specific project.

The term wireframe is mentioned in box 3, and refers to the practical visualisation of an app – so far. This is done with temporary layout on multiple papers, so you can “go through” the menus like a strip cartoon. This process is good at clearing out misunderstandings and creating a common picture, before too much programming has taken place, and thereby minimising the risk in the process.

Out of a project portfolio of five potential Apps, two of them have reached enough maturity to be described in a meaningful way. Focus will be on the process and not on specific content since it is neither fixed nor public disclosed yet.

The already mentioned KOL-App has attracted many stakeholders with the broad ambition of assisting patients in their post-rehabilitation process. A chronic disease can by definition not be completely cured, and patients with KOL will need a structured rehabilitation after the typical critical care at the hospital. After the rehabilitation programme, patients need to attend physical exercise appropriate for their conditions to maintain progress, which is often not achieved and stronger symptoms reappear. This is the current problem that the KOL-app is thought to deal with, motivating them to stay active although their conditions will fluctuate considerably on a weekly basis.

I regard to appendix #2, the KOL-app has moved through the four stages, and are now at the point where various inputs needs to be combined and an initial physical outcome inform of a wireframe is next on the agenda. The main sources of inspiration stem from patients and healthcare professionals in both OUH and a separate rehabilitation centre. From the very beginning, inspiration was broadly

sought by conducting an interdisciplinary workshop including multiple healthcare professionals, patients, programmers and business developers from AppCare, as well as both teachers and students from EAL. This is equivalent to the first stage in appendix #3. After defining the project (making it official), patients were "observed" in an event where the patients shared reflections on their daily life, and showing how the disease impacts them in very concrete ways. Briefly referring to the applied methodological framework of Yin (2009), this is actually more in line with participant-observation, because of the active role of the investigators (Yin, 2009, p. 111). In doing so, developers got a very practical, direct understanding of the challenges to be mitigated, when developing the KOL-app. This was part of the second stage in appendix #3. The third stage opened up for inputs from network partners, EAL students etc. who were also showing forth their current projects. In the mean time, a focus group interview was performed by a senior physiotherapist in charge of rehabilitation, and feedback was provided as the project entered the fourth stage. The current state of the KOL-app is actually described more precisely in the fourth stage of Appendix #2 (which divides the final work into two stages). Before further inputs can be obtained from patients, a more concrete, physical product has to be put forward, enabling them to expand their imagination and knowledge of what's possible. When consensus arises about functions, content, and layout, the process of prototyping can be begun.

The other project in AppCare's portfolio to be described is a smaller, less complex N-app aimed at enhancing the communicational efforts of doctors and nurses, when briefing patients. The challenge of communicating the "what", "why" and "how" in relation to what the patient has gone through, what treatments to choose between, and understanding the risks; is a general challenge in the healthcare sector. This is off course an issue that can always be improved - as was the case with enhancing the level of motivation in the KOL-app. But OUH's perception of this as a present opportunity containing true value for the hospitals departments, was also shared by the colleagues from the University Hospital in Kiel at the APPlied health-kickoff, where a very content-specific app was on the drawing board. The content-specific structure could be explained by the fact that the app is conceived and developed within one department, and (for now) only thought of as utilised within it. To the contrast, the N-app is aimed at scalability from the very beginning, a trait promoted by the leading persons at OUH, which in turn helps them attract ambitious developers. To do so, the

N-app is constructed as a small, online library with editable subject-related menus and visual content assisting as a library of slideshows, videos, external links etc.

Focus is on ease of use, quick and reliable performance, and flexibility of content, combined to be able to reduce preparation time and enhance the service delivered. The N-App has its contemporary name from the department it is developed in collaboration with, which is the neurological department at OUH. With diseases including apoplexy[7], epilepsy[8], and Parkinson's disease[9], informing patients about their circumstances, how treatment is going to affect them etc. becomes a much more important task than briefing e.g. a patient with a broken arm; thus a good and demanding place to start.

By initial appearance, the app seems like a "low hanging fruit" in regard to Appendix #3, the AppCare model. But when taken the potential of quick scalability into account, the project actually also has a big potential for both parts. The cost of customising the app to each department is fairly low for AppCare, since it merely is a matter of labelling the menus, changing the content and training the staff. By selling it separately to each department, they ensure that content is not edited or removed by other departments by a mistake, as well as it enables a degree of privacy in each department which might be preferred. Whether the sales will be structured as a sale, leasing or by choice is yet to be decided, but practical experience within OUH indicates that leasing should not be underestimated although it might involve a higher long-time price; due to budget restrictions on departmental level.

The process of developing the N-app has been dominated by regular meetings with OUH and visiting staff on the neurological department. The development is now more or less finished, as a working prototype has been tested and the staff has been trained in uploading and changing the content within the app. Introducing the app was done over more than day, to ensure everybody got familiarity with the software and thereby enable ease of use from the beginning. The fact that OUH still covers hours spent on implementation and training the staff, is a very positive factor in this regard.

[7] Bleeding within internal organs, historically linked to a stroke in the brain.
[8] Nerve contraptions leading to uncontrolled muscle spasm.
[9] Death of cells in the nerve system, causing increasing lack of muscle control.

# 5 Analysis and discussion

## *5.1 Public-private innovation collaboration*

An investigation performed by Capacent Epinion for the Danish Business Authority[10] (2009); presented a recent development in forms of public-private collaborations. The relatively new type of collaboration is labelled public-private innovation collaboration, referred to by its Danish abbreviation OPI.

The investigation is build on the arguement that it is a new promising tendency yet to be properly studied, and an investigation is therefore issued, which concluded that although the potential is evident across the country, a special potential and interest is shown in the Danish healthcare sector. This is both in regard to the private companies that can acquire a stronger and more direct access to the end users, as well as the possibility of testing their solutions within the framework of the collaboration. From the public perspective, intuitions seeking to mitigate the continuous challenges of balancing quality and efficiency (ebst., 2009, p. 3).

### 5.1.1 Characteristics of an OPI

The collaboration is typically not characterised as a buyer-supplier relation in contrast to other forms of public-private collaborations. Instead the relation consists of development partners with a common goal of innovation. (ebst., 2009, p. 6) Drawing from a group of successful OPI's, the report highlights some general characteristics, although great variety was found in the different cases: For the smaller private firms, the primary motivation was to develop a concrete product or service, tailor to the public healthcare sector and therefore yielding promising results. (ebst., 2009, p. 10) For the bigger, international companies, the motivation typically centred the possibility to learn from the programme, and gain insights in to the specific target group (of patients etc.) it involved. Finally, there seems to be a common tendency of a high level of end-user involvement, either directly or mediated through the relevant healthcare professionals. (ebst., 2009, pp. 10, 19)

This is very much in line with the specific case of AppCare and the Gamelab4health programme, where each individual project is targeting real-life challenges at Odense University Hospital, and also yields future possibilities of commercialisation for AppCare. In regards to the role of the bigger companies of Microsoft, Apple, and Samsung, who are engaged as *technology suppliers*, their

[10] Erhvervs og byggestyrelsen

involvement is also in line with the presented characteristics. These can furthermore shed light on their passive approach to any of the specific project developments. By following the development of the programme in a more general way, and potentially gaining insights of how both professionals and patients use their hardware, can be a valuable way of keeping track of the local market. Investigations performed by healthcare professionals in the KOL-app project, did in fact also contain assessments of the degree of technological sophistication in the user segment, and learning outputs from this and similar projects can accumulate to a stronger market insight in the long run if disseminated to the bigger companies. Besides that, ensuring that their hardware is available in the developing processes ensures that any potential big success is compatible with their solutions.

### 5.1.2 balancing risks and rewards

The degree of evolvement by the individual firms analysed in the OPI-report (cf. the discussion of small and big firms), do not only affect the possible economic and learning outcome, but the risk profile as well. A lower risk profile is constructed at the bigger firms, since they do not expect *direct* economic returns from the collaboration – although market insights and the positioning of hardware could have some significant long term effects. For the typical small firm, the situation is quite the contrary (ebst., 2009, p. 20). The risk for the private partner is of course highly dependent on the economic arrangement of the collaboration, where a commonly used solution is a split of financing burden, potentially reduced by external founds when available (ebst., 2009, p. 16). The risk can therefore be of a significant nature for the private partner, whenever they are dependent on a distant, future sale of the solution. (ebst., 2009, p. 20)

This leads the study to repeatedly conclude that private, deeply involved firms have a high risk profile, and finance is also mentioned as an entry barrier by the questioned (ebst., 2009, pp. 11, 12, 16, 19, 20).

The specific setting of the Gamelab4health programme is characterised by a favourable financial situation where OUH obtained and managed a budget of 11. million Danish kroner where made available from two EU-funds. As thoroughly described in the case, this allowed a model where AppCare (and other private partners) is paid on an hourly basis whenever working on a formal approved project. The risk is therefore significantly reduced to the time consumption of initial

preparation and meetings in each project. One might argue that this could *reduce* the incentives of the private partner to deliver as efficient as possible – meaning performing both high quality of product and speed of process. This kind of "squishing more hours out of a project" was by no means observed in the current case though, and besides the ethical considerations when provided with the possibility of a long time relation to a major client; a strong counterargument can be made from a cynical viewpoint as well. The case of AppCare is first of all characterised by more potential projects than what can be commenced at ones. This means that efficient project execution both reduces time to "real" market i.e. scaling the solution to the rest of the healthcare system and allows for more projects to be executed each year. Both factors linked to the significant part of the economic rewards. I would actually go as far as arguing that the incentives are even better in this financial arrangement, since hours spent by the developers on implementation and training the staff was also covered in the budget; hence allowing them to follow the solution to the very "end".

### 5.1.3 The Concorde effect.

In regards to managing different projects, and deciding which ones to proceed with, I would argue that this financial construction also makes it possible to better mitigate the classical economical and strategic issue of handling sunk cost. Popularised through "the Concorde effect" (Atkinson et.al. 2007, pp.210-211) the challenge arise when a firm has been investing resources in a given project, and the circumstance suddenly changes. The part of the investment which is already spend, cannot be retrieved whether abandoning the project or not, are therefore "sunk" costs and should not affect the decision. (Atkinson et.al. 2007, p. 208) One irrational (from the firm perspective) but human reaction to this dilemma, referred to as the Concorde effect, is to keep pushing forward and denying the changes occurred, risking even higher loss in the end. This might be done to defend or justify a "loosing project", and try saving the project by further investments. (Atkinson et.al. 2007, p. 211)

Lowering the risks associated with each individual project in the case of AppCare also lowers the risk of this (economic) dangerous behaviour. In any point of time, multiple projects "fights" for attention and with a considerable part of the sunk cost covered in the budget, more rational choices can be taken about if and how to proceed. In a less drastic situation, it eases the process of putting a project on a hold until e.g. key personnel is available, without adding significant financial pressure on the private partner.

### 5.1.4 Types of collaborations

Although the cases described in the OPI report is deliberately different in nature (ebst., 2009, p. 6), a dichotomy in types of collaborations was found as an overall tendency (ebst., 2009, p.21). On one side, relatively small local types of collaborations were initiated from the "bottom-up". These collaborations where driven by enthusiast and described as flexible with an ad hoc approach to the innovation process, and a typical involvement of 1-3 private firms. A common drawback was associated with the risk of isolation and lack of support from the rest of the organisation though. The other part of the collaborations was conducted by a consortium or more than three firms and research institutions as well. These collaborations where initiated from the top-down, managed through more formal relations and characterised by a predetermined innovation process. The bigger setups where shown to be able to attract bigger private partners, as well as providing a more stable financial situation around the projects. As a consequence of the larger setup, drawbacks where reported include lack of flexibility and a bureaucratic work process, especially perceived by the smaller firms. (ebst., 2009, p.21)

Describing the case of AppCare, and their collaboration in the gamelab4health programme actually contains traits of both types presented in the above dichotomy. On the surface, the gamelab4health programme is driven by a large consortium with the project leader at Odense University Hospital in front. As displayed in the description of gamelab4health, the basic innovation process of the predetermined project was established from the beginning, and a wide array of public and private partners and stakeholders involved – in the "open" stages. This is pivotal part of the process design, since the "closed" stages of process actually matches the benefits of the small, flexible setups described before. In each specific project, only one private partner has the main responsibility of developing the solution; which enabled a high degree of trust in the relation, speed in the process as well as it eliminated questions about who to pay and assign legal rights.

The open parts of the processes facilitated a broad array of inputs, networking amongst partners and the possibility of disseminate general applicable knowledge both in the informal network approach, as well as in the formal setting of seminars (cf. x.1.1.1 educating the network).

### 5.1.5 Sub conclusion

The case of AppCare and their relation to the gamelab4health programme, follows to a large extend the guidance of the OPI report presented in this section. This is not in itself surprising since the report was submitted approximately four years ago, and might – amongst other things – have affected the setup of the programme. It was though very evident that additional beneficial efforts were made in the gamelab4health programme, resulting in significant benefits of AppCare and thereby Odense University Hospital. The two most significant differences where the financial setup enabled by the EU-funding, and the dynamic interplay between openness and closeness in the innovation process.

## 5.*2 Complementary assets and competition*

So far, much of the empirical description has been from OUH's and AppCare's point of view, and especially the Human Cap part of it (due to my direct access), but if one for a moment takes a step back and regard it from AppFactory's perspective, it might at first glance seem like AppFactory has the most to offer in the gamelab4health programme.

To understand the interplay between these two partners, and the different competences shared amongst them, the much cited framework of Teece (1986) will be discussed briefly.

### 5.2.1 Profiting from technological innovation

In the article "*Profiting from technological innovation: Implications for integration, collaboration, licensing and public policy*", Teece (1986) addresses with the strategic challenges of how make sure to profit, when entering the market with an innovation, in the position as a first mover. Understanding the situations where one might expect success or failure in this quest, Teece develops a framework to "*determine who wins from innovation: the firm which is first to market, follower firms, or firms that have related capabilities that the innovator needs*." (Teece, 1986, p. 285)

At the core of this framework, are the three concepts of "*... appropriability regime, complementary assets, and the dominant design paradigm."* (Teece, 1986, p. 286)

*The appropriability regime* refers to the probability of the innovator to profit from his innovation, and a tight or strong "regime" refers to a positive situation for the innovator. The given situation is affected by a number of factors, mainly consisting of the nature of the technology and the legal mechanism put in place to protect obtained legal rights. As alternatives or supplements to patents, trade secrets and reliance tacit knowledge can be put into place when possible. (Teece, 1986, p. 287) The obvious consequence for the initial innovator in a weak appropriability regime is the ease access for competitors to imitate the innovation and change the completion into a matter of prices early on; thereby prohibiting the innovator of getting his cost of innovation covered. To prevent this from happening, "*... it appears that innovators in weak appropriability regimes need to be intimately coupled to the market so that user needs can fully impact designs*." (Teece, 1986, p. 291)

Explaining the nature of the *dominant design paradigm*, Teece (1986, pp. 287-288) refers to a parallel between the world of scientific research and the technological development of an industry. In the world of science, a natural progression will go from a situation where "*... there is no single generally accepted conceptual treatment of the phenomenon in a field of study, ...*" (Teece, 1986, p. 287) in the preparadigmatic stage. When scientific acceptable contributions accumulates, a paradigm can start to form, and standards regarded as normal will stay central until the paradigm is overturned. (Teece, 1986, p. 287)

The same tendency can be witnessed in industries, where the products and processes move from greatly varied group, and towards the most successful designs, representing the competition in the process; "*The competition amongst firms manifests itself in competition amongst designs.*" (Teece, 1986, p. 288) Once a dominant design has emerged, it will by definition not be feasible to oppose it, and competition will be more capital-intensive as the price becomes increasingly important. Due to the argument of mass production, this will be most evident in markets with mass consumption. (Teece, 1986, p. 288)

When describing the concept of *complementary assets* Teece (1986, p. 288) takes the standpoint of a technological innovation, which is to be commercialised. Besides the innovators technical knowledge which enabled him to make the innovation in the first place, it is almost always necessary with additional capabilities or assets this process successfully. These are the *complementary* assets, and can be as practical as the functions of marketing, manufacturing, or different support units (Teece, 1986, p.288).

If these assets are outside the innovators control, or possessed in a more competitive way by a potential imitator, the innovator is not likely to receive the major economic benefits of the innovation. Different tactics for dealing with this is discussed throughout the article, and too elaborate to explain in its full extend here, but the overall consideration regards ensuring access to the critical complementary assets, trough means ranging on a continuum from the lose relation of contracting, to acquiring either the assets or its owner. (Teece, 1986, pp. 292-293) As one example of a solution in between the abovementioned extremes, is the decision to fund a joint venture (Teece, 1986, pp. 285, 300). This naturally leads back to the case of AppCare.

### 5.2.2 Understanding the joint venture of AppCare

When comparing the two partners in AppCare through the notion of *complementary assets* (Teece, 1986), it becomes clear that AppFactory posses all the need competences for launching an application. Just consider the fact that they were the ones getting involved in the project from the beginning (hence their company name on the official papers), and that they have four years of regional, national and international experience in making successful apps, customised to the client. Despite this, they hold only 50 % of AppCare, affecting future returns from selling their shared applications; off course both partners continue their independent business alongside AppCare, but what is it that makes it a good deal for them?

To fully answer this question, a distinction has to be made between short term and long term considerations. In the imminent future, the benefits of accessing the capabilities of Human Cap can be reduced to the possibility of a stronger pipeline. Dealing with task such as project management and performing conceptualising in close collaboration with client (Odense University Hospital). This is by no means an irrelevant task, since the situations is characterised by plenty of work to all, and bringing more people "to the table" means quicker and better results. These improvements yield the possibilities of establishing a strong, long time relation to OUH, which is a huge regional as well as national client within the healthcare sector. In addition, The high level of interaction with not only the contact person at OUH (i.e. the client) but also with healthcare professionals, patients, and other stakeholders; handled to a large extent by the Human Cap people, positions AppFactory's employees with a higher possibility of focussing on their core competences than they would otherwise have done. If this results in more projects, in could provide a higher turnover for both parts.

The sub-industry of developing app's could very well be argued to be characterised as a weak appropriability regime, since all that a potential imitator has to do when an initial App is launched, is to make some minor changes to the design and maybe adding a function. This is why established firms like AppFactory (and now AppCare as well) are focussing on clients ready to pay for customisation and quality. Recapping the framework of Teece (1986), this situation tends to require a very close connection to the market (Teece, 1986, p. 291), which is exactly what the joint venture enhances to possibility of.

The emergence of a *dominant design* in the broad industry of applications is more related to a complex strategic battle between developers of operating systems (Apple, Android/Google and

Microsoft/Windows Phone) and hardware producers (Apple, Microsoft/Nokia and wide array of producers for the android platform, lead by Samsung). It is here interesting to note, that the three technical suppliers in the gamelab4health programme[11] represents the three platforms of operating systems. In a contrast to this "battle of giants" the industries developers of applications usually produces to all three platforms at the moment, although Apple is the preferred platform to start for many.

When shifting focus to a medium or long term perspective, the partners expect the need for different capabilities to arise.

The first and foremost important task to address is the commercialisation and scaling to the rest of the national industry and beyond. This would most likely require additional financial strength to customisation and implementation in a satisfying pace. Gaining and maintaining good investor relations is as actually a part of the core competencies at Human Cap, and the possibility to do so in an efficient way is likely to be a distinct advantage in the future competition.

Another key capability, which is expected to influence the success specific in the healthcare industry is the access to two layers who are partners in Human Cap. By having them as partners, allows the relatively small firm to draw on otherwise very expensive capabilities, when venturing further into the complex and highly regulated industry.

### 5.2.3 Strategic alliance

As might already be evident from the description in this section 5.2, the competition between apps is more driven by conceptualisation, design, new features, and customisation, than it is by pure programming skills. Having a continuous flow of new, promising projects and gaining access to interesting clients can therefore be agued as an asset in itself.

The remaining of Human Cap's core competences are the ones of ferret out promising new business opportunities, judge their potentials, as well as executing the most interesting ones. By strengthening their relation to human cap, AppFactory is paving the way for future projects or collaborations outside the health care sector as well, and thereby increases the robustness of the firm.

[11] Microsoft, Apple, and Samsung

### 5.2.4 Sub conclusion

The purpose of this section was to deepen the understanding the joint venture of AppCare. The logic rational from AppFactory's point of view was devided into an imminent future, where Human Cap enabled a stronger pipeline. As well as the possibilities of establishing a strong, long time relation to OUH. Recapping the framework of Teece (1986), the competitive situation of AppCare tends to require a very close connection to the market, which is exactly what the joint venture enhances to possibility of.

When shifting focus to a medium or long term perspective, the partners expect the need for different capabilities to arise, to be able to address is the commercialisation and scaling to the rest of the national industry and beyond.  This included the availability of layers within the Human Cap setting, regarded as a distinct advantage.

# 6. Conclusion

This case study research aimed at exploring the case of the newly established joint venture of AppCare and its relation to Odense University Hospital through the gamelab4health programme.

The case of AppCare and their relation to the gamelab4health programme, follows to a large extend the guidance of the OPI report in the analysis and discussion. Important differences was notable though, which was assessed to create and even more fertile situation than what was described in the OPI report. Guiding further research and practical programme designs in accordance to these findings and considerations, might therefore yield interesting results. The main two differences where the beneficial financial setup, enabled by the EU-funding. As well as the dynamic interplay between openness and closeness in the innovation process facilitated by OUH.

In the quest of further understanding the joint venture of AppCare, the logic rational from AppFactory's point of view was critical assessed, and divided into an imminent future, where Human Cap enabled a stronger pipeline, which was combined with the possibilities of establishing a strong, long time relation to OUH. The competitive situation of AppCare may force them to keep a very close connection to the market, which is exactly what the joint venture enhances to possibility of.

When shifting focus to a medium or long term perspective, the partners expect the need for different capabilities to arise, to be able to address is the commercialisation and scaling to the rest of the national industry and beyond.  This included the availability of layers within the Human Cap setting, regarded as a distinct advantage.

# 7. Literature list:


**Andersen, I., Borum, F., Kristensen, P., H., & Karnøe, P. (1995)**. *On the Art of Doing Field Studies – An experience-based Research Methodology*, Handelshøjskolens Forlag

**APPlied health-kickoff**: Kickoff event on the APPlied health project, attended on the 28th of February, for more information see: http://appliedhealth.eu/kick-off-thank-you-for-participating/, located the 7th of March, 2013

**Atkinson, A. A., Kaplan, R. S., Matsumura, E. M., & Young, S. M, 2007**, Management accounting, (5. Ed.), New Jersey: Pearson Education

**Computerworld.dk:** http://www.computerworld.dk/art/226867/sundhedsminister-erkender-her-er-stopklods-for-telemedicin?goback=%2Egde_3281671_member_244341762, located the 26th of May, 2013

**ebst., 2009,** *Analyse af offentlig-privat samarbejde om innovation*, Albertslund, DK: Schultz Distribution

**Flyvbjerg, B., 2008**, Fem misforståelser om case studier, pp. 463-487 In: Brinkmann, S. & Tanggaard, L. (red) *Håndbog om de kvalitative metoder*. København: Hans Reitzels Forlag.

**Grebel, T. (2011)** *Innovation & Health - Theory, Methodology, and Applications*. Cheltenham, UK: Edward Elgar Publishing Limited

**gamelab4health.dk A**: http://gamelab4health.dk/om-os/, located the 4th of March, 2013

**gamelab4health.dk B**: http://gamelab4health.dk/seminarer-og-workshops/, located the 12th of May, 2013

**gamelab4health-kickoff:** Kickoff event on the gamlab4health project, held on the 11th of February, 2013. For more information and video presentation (Danish) see: http://gamelab4health.dk/videoer-fra-kick-off/, located the 12th of May, 2013

**Interreg4a**: http://www.interreg4a.dk/wm390728, located the 10th of May, 2013

Kvale & Brinkmann, 2009, *Interview – Introduktion til et håndværk* (2. ed.)København: Hans Reitzels forlag

**Lunge.dk:** http://www.lunge.dk/kol, located the 5th of March 2013

**manhattanresearch.com:** http://manhattanresearch.com/Infographic-Images/data-snapshot-taking-the-pulse-us-image, located the 2nd of June, 2013

**Meeting at OUH**: refers to non-codified knowledge obtained and verified at my visits and participations at meetings.

**mhealthsummit.org A:**
http://www.mhealthsummit.org/sites/default/files/2012_mHealth_Summit_Wrap_Release_FINAL.pdf, located the 2nd of June, 2013

**mhealthsummit.org B:**
http://www.mhealthsummit.org//sites/default/files/2012mHS%2C%20Attending%20Organizations.pdf, located the 2nd of May, 2013

**ouh.dk 1:** http://www.ouh.dk/wm125534, located the 12th of May, 2013

**ouh.dk 2:** http://www.ouh.dk/wm397745, located the 5th of June, 2013

**Tanggaard & Brinkmann, 2010,** 1 interviewet samtalen som forskningsmetode. In Brinkmann, S. & Tanggaard, L. 2010 *kvalitative metoder- en grundbog* (1st. ed.) pp. 29-53. København: Hans Reitzels Forlag

**Teece, D. J. (1986).** Profiting from technological innovation: Implications for integration, collaboration, licensing and public policy. *Research policy*, 15(1986) (pp. 285-305)

**who.int**: http://www.who.int/respiratory/copd/en/, located the 5th of March 2013

**Yin, R. K., 2009,** *Case study research – Design and methods* (4. Ed.), Thousand Oaks, CA: SAGE Publications Inc.