Dutch Telecare Review

A compilation of success and failure factors for e-health, telecare and home automation found in current Dutch literature.

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Summary

The Dutch partner in TCares, Zorgcentra Pantein, has made an analysis of succes and failure factors in recent Dutch telecare projects. The analysis was made by holding interviews with key persons in recent telecare projects and by a literature study.

All failure and success factors are divided into three different categories: project management, business model and implementation model.
From our findings we concluded that the implementation model has the most identified success and failure factors. No less than 16 failure and 9 success factors were identified in this category.

We will now sum up the success and failure factors per category.

Implementation Model
Failure factors:
The legislation is not set on innovative concepts.
The legislation is lagging behind on technological capabilities.
The regulations may vary by region causing confusion.
The regulations can be contradictory.
User is not the starting point for the development of E-health and home automation.
Applications focus on the possibilities of technology.
Not clearly demonstrable added value of home automation and e-health care for the receiving user.
Doctors see e-health and home automation as an erosion of care.
Users are not involved in the development of e-health and home automation applications.
Receiving care users do not know how to deal with e-health and home automation products.
Too little insight into the demands and wishes of users.
Insufficient support and acceptance by staff / carers.
Insufficient support and acceptance by the patient.
No long-term acceptance of end users.
Technical solutions are often not certified.
Unreliable technical solutions.
The absence of a continuity plan for 1, 2 and 5 years.

Success factors:
The residents see privacy as an exchange relationship which they can trade for safety and comfort.
Users see the benefits of social aspects of e-health applications: for example, contact with distant relatives, and the possibility always to connect to a caregiver.
Clients sometimes find that they have better contact with an e-consult. They dare to ask and tell more.
Residents will, after some time, automatically use features that they previously did not seem to want or see fit.
Clients are willing to pay for home services when added value for them is demonstrated.
Security is most valued by a user (burglar alarm, telephone care, personal alarms), followed at great distance by comfort/luxury services.
Demonstrating benefits exceed the costs.

Business Model
Failure factors:
Hardly any investment.
No clear earnings model.
No fixed costs for e-health services to patients.
Only grants available, no structural funding.
No clear cost to the user.

The products are too vendor dependent.

Success factors:
Open source software for office applications instead of Microsoft, to cut costs.
Ability to differentiate from other care suppliers by introducing e-health services.
Clients are willing to pay for home services as an added value for them is demonstrated.
Regulatory changes may affect the business model by allowing certain technology to be compensated.
Funding based on DBC structure ("diagnosis/treatment combination" is a new Dutch budget mechanism where you get a fixed budget for the diagnosis and treatment of certain illnesses).

Project Management Method
Failure factors:
Projects are difficult to manage.
Unclear division of responsibility within the project participants.
The absence of chain responsibility.

Success factors:
Scale through cooperation.

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Research setup

Problem definition
The problem is as follows:

There is insufficient understanding of methods for e-health and home automation projects to be successfully introduced.

In this review, it is important that we use different research approaches to thoroughly investigate the problem. We will do this through brainstorming sessions, researching literature and gathering practice information and examples through interviews with key persons in the world of e-health and home automation.

Method
First a literature study is performed. The literature documents will be reviewed. The relevant information that emerges from this literature, will be recorded in fact forms. Fact forms are small summaries of the literature in which only the key points and relevant issues are included. Fact forms are the basis for this document, because they contain all the success and failure factors in the literature, in a rough form.
These fact sheets will eventually be incorporated in the results per category. They are also the basis for formulating questions to be asked of the experts in the field of e-health and home automation.
Three experts were selected through recommendations of our telecare network and were interviewed:
A manager / project leader at home automation projects. Employed by an electrical installation company, aimed at businesses and institutions in the region of North Brabant. A company like which specializes in home automation systems, integrates knowledge-intensive products and systems solutions tailored to the specific residential and business needs.
A teacher and consultant in project management tools like PRINCE 2 working for a company engaged in the development of information and providing ICT advice, was asked about his experience in introducing the electronic patient file.
The director of Smart Homes, the Dutch Expertise Centre on Home Automation & Smart Living. From 1993 on, they have been involved in the development of smart, understandable and accessible technological solutions and services for the personal environment.

Describing the results
We will first describe the concepts of E-health or Tele-health and Home automation or Tele-care. Then we will describe our findings in a number of factors identified as important in our literature study. At the end we will categorize the success and failure factors in to three categories: project management, business model and implementation model.

Results

Telecare and home automation

There are various definitions of home automation, Smart Homes defines it as follows:
"Home automation is the integration of technology and services within the home, with the aim of improving the quality of living of residents by promoting more and better safety, comfort, communication and technical management." (Bierhoff & Erdtsjek, 2007)

This means it only focuses on automation technology in a home and with the aim to promote better quality in terms of safety, comfort, communication and technical management.

IRv
IRv The Institute for Rehabilitation and Disability uses a more summary description of the meaning of home automation:
"In home automation are many definitions. All have in common that it is the application of technology in a home environment. " (Willems, 2007)
The IRv, is a social organization that wants to ensure that people with disabilities more and better participate in the social community. (Willems, 2007) The IRv gives several examples of home automation applications focused on care at home.

Here are some examples of the possibilities for automatic IRv focused on care in the home:

- Video (Viedome, Homecare Online, Camcar, Sensire)
- Granting Remote Access
- Data exchange in the context of home care (ZorgTV, Health Buddy)
- Acoustic signaling/detection
- Detection of wandering behavior by using GPS (eg dementia)
- Video support therapy at home
- Lifecircle approach for people with dementia (Willems, 2007)
- Call for help / emergency button
- An electronic door opener
- Day / night switching of functions
- Automatic electricity meters recording

Preliminary results
With a separate system they have realized an intranet for the residents. This system is suitable for the target group being people with a limited need for support. For clients with limited hand function and an increased demand for care, the system is less suitable:

- The system is not designed for large numbers of calls
- There is only one fixed inter compost throughout the house.
- There is no distinction in the urgency of the calls.
  (Erdtsjek & Bierhoff, 2007)

Definition
We will use the definition of home automation, established by Smart Homes in the rest of the literature search. We believe that the definition of Smart Homes best describes the significance of home automation because it is more specific.

Smart homes categorizes home automation applications in different stages of healthcare automation projects. These stages of care projects are:
1.First generation home automation projects for care
2.Second generation home automation projects for care

3.Projects focused on virtual healthcare

The first generation of home automation projects are also called traditional home automation projects. Under traditional home automation applications the following applications are included:

- Access / electronic lock;
- Automatic lighting;
- Home / road, day / night switch and cooking;
- Active and passive care alarms;
- Remote control lighting, blinds and opening of doors;
- Fire;
- Burglary;
- Light Scenarios;
- Walkway lighting;
- Automatic curtain rail. (Erdtsjek & Bierhoff, 2007)

Following the evaluation of the first generation projects, improvements are included in the second generation projects. In these projects there is not only attention for "classic" home automation applications (applications from an electrical background) but also to applications that focus more on ICT.

Smart Homes defines the following implementation of home automation products in the second generation of projects:

- Residential Gateway as a single point of access to the house
- Broadband
- Communication via an intranet
- Computer courses

In the field of virtual care there is much activity. This is because screen-to-screen contact recently may soon be compensated through healthcare insurance.
"Remote care" is to follow and communicate with clients through a screen, also called screen-to-screen care. Screen-to-screen care is used for people who have no indication for inpatient care, but an indication for nursing and / or personal care. This form of care offers many advantages, according to evaluations of Dutch authorities NZa and Nivel. Clients feel more secure with this system at home and problems are earlier identified. This supports self-care and results in fewer admissions to hospital, or nursing homes. The health professionals involved are enthusiastic about this type of care.
The experiment "remote care" ended on July 1, 2010. Because the results are positive, participants may continue this care after termination of the experiment. The cost for this type of care can be claimed until January 1, 2012. In the meantime the Dutch Healthcare Authority (NZA) with the Ministry of Healthcare and Wellbeing and Actiz are negotiating how this form of structured care could be financed in future.

Examples of telecare in the Netherlands
The final report on care related home automation (Erdtsjek & Bierhoff, 2007) there are examples of projects where there are home automation applications are deployed. We give a brief description of the purpose of the project and a description of the technology used in that project. In addition, we indicate why the project failed or not, so we chart the success and failure factors of home automation solutions in healthcare.

Project Vestia, The Hague (Erdtsjek & Bierhoff, 2007).

The aim of the project is Vestia live longer independently through the use of modern technology.
This is laid out into the following three points:

- Enhance social cohesion and enable the residents, with the use of broadband and Web and using existing infrastructure;
- Develop scenarios for the provision of services outside the Coornhert Centre building and in its own building with the support of ICT;
- Develop scenarios for an appropriate range of services by Vestia to improve the quality of life and to live independently at home for longer.

The problems observed in this project are as follows:

- The system is not designed for large numbers of calls.
- There is only one fixed intercom station throughout the house.
- There is no distinction in the urgency of the calls.
- There is no integrated intercom station with the front door.
- The operation is quite complicated.
- Absence of backup power supply in case of system failure.
  (Erdtsjek & Bierhoff, 2007)

This was project with real users for these home automation solutions. After these findings, there are a number of lessons drawn. These points are described below:

The lessons learned from the "Serviceflat of the 21st century" can be summarized as follows: Complexity: Introducing automation in an existing setting is complex. Not only because of the fact that there are existing buildings and therefore limited opportunities, but it is difficult to keep all players facing the same direction to go.

Wires & gossip: Technology is only supportive. Without the help of a caregiver, the project has no chance of success.

Introduction: better dosing. Almost all applications are new to the residents. The process of introducing them needs to be done gradually to smoothen the introducing of features. Introduction of a meeting room: By creating a space where people can talk about the facilities, these become more accepted and better used.

Flatnet positive, but needs more participants. The use of the possibilities of Flatnet are a positive experience but a true Internet community should be larger than ten persons participating in the experiment. Extension to the neighborhood is a good solution.

Offering computer courses and PCs: The current generation of elderly people often have no experience with PCs. Within this project, courses set up where a lot in demand. Participants could also use a loan PC.

Installation underestimated: At the start of the project it was assumed that installing the facilities would take one day per apartment. In practice, this estimate was exceeded many times.

Instruction easier and more use of visual aids: The instructional materials had been drawn up with the aim to be as simple as possible regarding the functionality of the display, but it turned out that the instructions had to be even simpler.

Cutting cost to operate profitability: It is believed that the residents are willing to pay no more than a contribution of 25 euros per month. Knowing this, the present operating cost for the project is not viable for large scale introduction yet.
(Erdtsjek & Bierhoff, 2007)

E-health solutions in care

The document "Understanding e-health" commissioned by the Dutch Health Ministry, the term e-health is described:
"The term E-health is often used for (commercial) applications that use Internet technology for information, products and / or services to offer care. Eysenbach defines e-health as an area located at the intersection of medical informatics, public health and business and related to it via the Internet and associated technologies offering health and health (care) information. " (Sequences, Ribbon, & Otte, 2002)

In this paper we use the following definition:
E-health is a term for applications that use Internet technology to offer information, products and / or services in health care.

According to the to the Dutch Council of Public Health, E-Health Applications can be divided into three clusters:
1.E-Care;
This area is largely covered by the concept of telemedicine.
Focused on the patient, who often lives independently and there is an Internet connection.
E-care includes:
a) E-Diagnosis: the research and diagnosis. An example: E-Diagnosis to their GP. This can serve as a substitute for a visit to the GP or telephone consultation.
b) E-therapy: controlling remote equipment, medication and therapy at a distance.
c) E-Care: E-monitoring (remote monitoring of body functions), security monitoring and remote instructions.

2.E-Care Support;
Aimed at healthcare professionals and students.
This includes:
a) E-Quality: Training and retraining through available information and patient simulation.
b) E-Administration/management: agreements, records and inventory are electronically tracked. Think of the electronic patient record.

3.E-Public Health.
Aimed at the general public: prevention, health promotion and health education.
(Dutch Council for Public Health, 2002)

In our research we focused mainly on one point. E-Care, because it focuses on the actual provision of care.
The Dutch Council for Public Health examined threats and benefits of using e-health.
Possible benefits according to the Council are:

- Improving the quality of care
- Increasing the efficiency of care
- More efficient use of professionals
- Improving the doctor-patient relationship
- Increasing amount of health care
- Improving access to care
- New organizational structures
- New opportunities for education
- New forms of care

The overall e-health threats, according to the Council are:

- Poor quality and fraudulent activities

- Infringement of privacy and confidentiality
- Errors in software and / or equipment
- Abuse
- Social isolation
- Increasing socio-economic divide
  (Council for Health, 2002)

With the rise of the Internet usage, there are more people with computer and Internet experience. This ensures that e-health solutions today has a higher chance of success, depending on the goal. But, there are still groups that can not easily access these options: people with low incomes and older people without Internet experience.
(Huson & Nordeman, 2008)

Business Model

Innovative projects have the best chance of success in a business where it is well thought through and calculated what the end result will be and how the project will finance itself in the future.
The funding appears to be, as so often in the care, the main obstacle. Many tele-care programs now run on grants and once these are threatened to stop the whole service concept stops too.

It is important to have a sound businesscase to pass the stage of grants. (Hettinga & Janssen, 2007)
In the Netherlands, about 2% of the care budget is spent on ICT. Compared to other industries this is a very modest percentage. In addition, there is the perception that financial resources are not deployed cost-effectively.
Actually the following three problems are occurring:

Few investments in e-health
Investments in telehealth are necessary because otherwise healthcare will not manage to deliver enough care considering a rising demand and the increasingly tight labor market. There is actually very little investment, partly due to the lack of arrangements / funding possibilities for ICT investment. All investments in health care are indeed currently spent on more labor, while there is a need to invest in ICT.

Virtually no fees for e-health
There is little or no fees for e-health applications, no compensation rules / rates for e-consultations and telemedicine activities in general. However, in individual cases or projects, agreements between insurers and care are successfully made.

Few cost-effectiveness studies on e-health
There is little data on the cost of e-health applications. At this time, regarding many (new) e-health applications, they have not been found more effective than traditional care, while it is expected that this is the case. This concerns not only about savings in Euros only, but also benefits due to quality gains through timely information and no information loss and the societal impact of such applications. The lack of such studies is one of the reasons that the healthcare sector find that little incentive exists to invest in e-health. This also means that financiers like insurers are reluctant to reimburse the cost of these investments. (Council for Health, 2002)
It is also a problem in health care that benefits of these investments mainly go to another party (ministry or the insurers) in stead of the investor (health care organisation).

Another reason is that large numbers of patients are in care, and the costs per patient or home are very different from each other. This makes it difficult to calculate cost and benefits for a large group.

Use of Open Source software can suppress the cost. This is as reliable as the applications from Microsoft, but is free to obtain and cheap to maintain. This approach can help keeping the overall ICT costs low.
(Foroutanian, et al, 2007)

Furthermore, through the Dutch “DBC structure”, healthcare funding based on diagnose-treatment combinations, it is possible to substitute traditional care services, such as regular doctor appointments, to be replaced by telemedicine (tele-health) because in DBC's there is no longer a distinction of the medium through which a healthcare service is provided. This financial development actually makes it financially interesting for doctors to practice monitoring for early detection after medical treatments.

E-health can help to improve competitiveness. For example, E-consulting with GP's left a good impression. E-consult provides more customers (4% growth per year) and provides a high degree of satisfaction. (86% are satisfied according to www.webspreekuur.nl)
Customers are happy because the E-consultation has many positive aspects for both the physician and the customer. The conversations are shorter and to the point, there is no waiting time, patients dare to ask more relevant questions and lower costs per call with higher quality than before. (Council for Health, 2002)

Failure and success factors related to the business model

The failure factors (Businesscase):

- Hardly any investment. (B)
  In care there is little invested in e-health. In addition the patients and doctors prefer more hands at the bed, so the financial means are rather spent on extra manpower instead of a new IT projects. This keeps the system in the phase where it is today, and frustrates innovation in the field of ICT.

- No clear earnings identified. (B)
  There is no clear revenue model, this is definitely a failure factor as these aspects of the company are not made visible. Healthcare industry in the Netherlands has poor knowledge of their infrastructure, customers, supply and finance. If the income it is not clear, then the financial basis of the product is not clear, and this goes for the entire organization, not just E-health.

- No fixed costs for e-health services to patients. (B)
  In the Dutch healthcare, the costs are usually individually calculated, so there are no constant costs. This makes it difficult to calculate business cases. Developments like the DBC as we described earlier are demonstrating to be effective regarding to this point.

- Only grants available, no structural funding. (B)
  At present there are only grants available from the government, but these subsidies are not structurally like the cost. Sometimes there are more types of grants available, such as those of municipalities, provinces or special arrangements. However, because there is no steady income, the organization of e-health remains very unstable. Even when the grants are generally high enough, the organization keeps depending on them. We see a lot of projects ending as soon as the grant is ended.

The success factors (Businesscase/Implementation):

- Open source software for office applications instead of Microsoft to cut costs. (B)
  With the use of open source software there can be significant cost savings. Usage is free, the service is very cheap and above all very easy.

- Funding based on DBC structure (Diagnose Treatment Combination). (B)
  The DBC structure substitution commit. Thus, it is possible to substitute traditional care services, such as regular doctor appointments, to be replaced by telemedicine (tele-health). This is a success factor because with telemedicine costs are cut, including working time per patient, travel time, or paperwork. Also early detection of complications prevents unnecessary cost for treatment.

- Demonstrate benefits exceed its costs. (I)
  The costs and benefits are not fixed. There are examples of benefits that exceed the costs. A lot of these earnings are depending on a successful implementation strategy. For example in a project in the city of Utrecht, a project has shown more benefits than costs, thanks to good cooperation. This project involves four pilots, all to do with home

automation. Benefits will exceed its costs, provided there is good will and cooperation between healthcare providers social housing organizations. However in project “BUUF” (neighbor) in Utrecht, in which residents are using a touch screen to communicate with family, etc.) things are not going well due to different opinions on the demands for the project between the housing association and the care organization.

- Ability to distinguish your organization by introducing e-health services. (I)
  Using e-health, care centers can easily distinguish themselves from others who don't. Thus we have seen that e-health services such as e-consultation (doctors appointment at a distance), benefits both the patient and the physician. This is a success because it attracts new customers, it saves cost for both the patient and the doctor.
  The doctor can work with a more flexible agenda, he wins both time and money. A care center may be different from others in a positive way using e-health services.

Technology

As with the terms "E-Health" and "home automation" also "technology" may be seen as a container concept. By "technology" we mean all physical mechanical or electromechanical devices that make home automation and / or E-health possible.

The technology develops at a rapid pace and for virtually any problem there a proliferation of technical solutions emerge. Due to the lack of specific certifications, guidelines and statutory regulations the technical solutions are not sufficiently tested and are not always appropriate to the demands and wishes of the customers. Often they are not developed in collaboration with end users. Especially the latter is very important for the acceptance of a product. Users need to feel that they "contributed" to accept the product. (Erdtsjek & Bierhoff, 2007)

Producers of technical solutions are bringing many products to the market that do not need to meet standards. Simply because there are no mandatory or agreed standards. This proliferation of solutions leads to a supply-oriented market for technical solutions in both E-health and home automation. This means that customers need to perform thorough risk analysis to ensure that technical solutions to be purchased are well tested and the suppliers meet certain existing certifications (eg ISO certification). (Wal, 2008)

Because of the technology driven market, most solutions (in the form of technical products), are not fitting the living conditions or business process of the end users. Products are designed primarily to a known (social) problem, but are designed too generic for a care organization that is looking for technical solutions that fit their business. To change this situation, the market has to turn around, starting with stopping further proliferation of ready-made products that are currently available. Care providers must carefully select technology suppliers who are prepared to work together with the care provider to look for or develop a suitable product. It should also be considered whether the products can be supported and maintained by third parties. This allows for better continuity of the solutions. In addition, there is an extensive risk analysis to be conducted so that no unexpected side issues arise at a later stage (eg a bad support or poor maintenance of equipment). The analysis is an absolute requirement to prepare a technical continuity plan for 1, 2 and 5 years to be agreed with a supplier . When preparing a risk analysis one should keep in mind:

- The need for the product
  (Because it has happened too often that hastily purchased products are not directly necessary and not used or too little used)
- The benefits of the product
  (The product is to make the life or job easier. The benefits should therefore be greater than the disadvantages)
  The accessibility of the product
  (The product should be easy to use by end users. This means that it should be developed to fit the knowledge and experience of the end user)
- The functionality of the product
  (The functionality of the products must fit within the demands and wishes of end users and carers)
- The personification of the product
  (Products that have a high adaptability are often quickly accepted by the end user)
- The social acceptance
  (A product is quickly into the home if "the neighbors have it too")
- Maintaining the continuity of the solution
  (How can I ensure that the product is still available in 1, 2, 5 years or longer?)
- The responsibilities of the parties
  (To stop confusion, it is important that all responsibilities of the supply, support, maintenance, phasing, development and extension of the product are clearly

established)
(Sponslee, Schouten, Bouwhuis, & Willems, 2007) (Foroutanian, et al, 2007) (Nouws & Sanders, 2007)

Major advantages of using technical solutions:

- Lower margin of error in routine
- Faster communication between two or more parties without need of physical presence
- Early signaling in certain situations (fire, altered heart rate or on a missed intake of medication)
- Patients may remain at home longer and can take better care of themselves

The major drawbacks of the use of technical solutions:

- Technical solutions generally do not fit into the environment of the user or within the business
- The current technical solutions supporting (almost) no technical cooperation with other third-party solutions
- The solutions are dependent on the supplier
(Willems, 2007) (Kieft, 2007) hours)

User oriented solutions

Today Domotics or home automation means the integration of various technical solutions in and around the habitat of man. The "old home automation" is not accepted anymore by the end user because of poor coordination, cooperation and support of products (each solution had its own supplier). The technical solutions must be simple and be told "to operate with 4 buttons instead of 50 of the predecessor or competitor" according to Wesly Boom of Welvaarts B.V., a Dutch supplier of domotics.
The technical solutions are developed according to the NEN standards (by the Welvaarts company) and developed in accordance with the CSN certificate, DBC / DIS AZR certification (at the company Ranwood). Both parties acknowledge, however, a standard or umbrella / certification is missing in the field.
(Huijgen, 2010) (Boom, 2010)

Furthermore, technical solutions must be tailored to the end user. There is a study of demented elderly people who had automatic curtains installed in their house. The initiative came from the care provider who wanted the elderly not have to worry about opening and closing the curtains . The investigation subsequently revealed that the users were confused by the automatic transactions and did not understand what happened. This caused fear and loathing, so the home automation solution was removed.
(Hoof & Kort, 2008)

The Failure factors (Business case and Implementation):

- The products are vendor dependent. (B)
Currently the products are still too dependent on the supplier. Eg support also must be performed by the supplier. This creates a monopoly for the supplier which could lead to higher costs and conditions that may be better at third vendor. (Kieft, 2007)

- No long-term acceptance of end users. (I)
Technical solutions which are an extension of life or someones work are more likely considered as "normal" then a technical solution that is not appropriate and seen as a stand-alone product. This standalone product is often avoided or not used optimally due to low acceptance and poor connection to the user environment. The poor acceptance is more common among users who need to work with the technology than users who have to live with it. (Velde, Cihangir, & Borghans, 2008)

- Technical solutions are often not certified. (I)
  A major disadvantage of technical solutions in healthcare is that certification is not a requirement in many occasions. Suppliers are missing this incentive from their customers. In the care sector more often compliance with legal rules and the accompanying papers are deemed important.

- The absence of a continuity plan for 1, 2 and 5 years. (I)
  Technological developments should be updated, so they contain the latest developments and not perish from mistakes and become obsolete. Most vendors provide an SLA (Service Level Agreement) with the products stating how and when support is provided for the product. However updating the product so it doesn't have to be replaced in a few years is hardly ever included in these SLA's. (Velde, Cihangir, & Borghans, 2008)

- Unreliable technical solutions. (I)
  It is well known that technology can fail. Users are aware of this, thinking of their DVD player that is broken or a cell phone that needs to be rebooted. But once end users with reluctance start to use technical solutions that becomes a threat in case of a failure (eg think of alarms), then the users will immediately abandon the product after experiencing a failure. (Sponselee, Schouten, Bouwhuis, & Willems, 2007)

- The absence of chain responsibility. (P)
  It is unfortunately still too often the case that the technology providers deliver "their part of the application" and not bother about compatibility with other applications. It is often not currently contractually committed that suppliers bear responsibility to this compatibility. This should however always be part of the contract, so that the suppliers make the effort to deliver the product matching the needs and working demands of the end user. (Nouws & Sanders, 2007)

<u>The success factors:</u>

In the literature we studied not success factors where identified on this subject. Indeed all projects seem to have some failure factors in this area though.

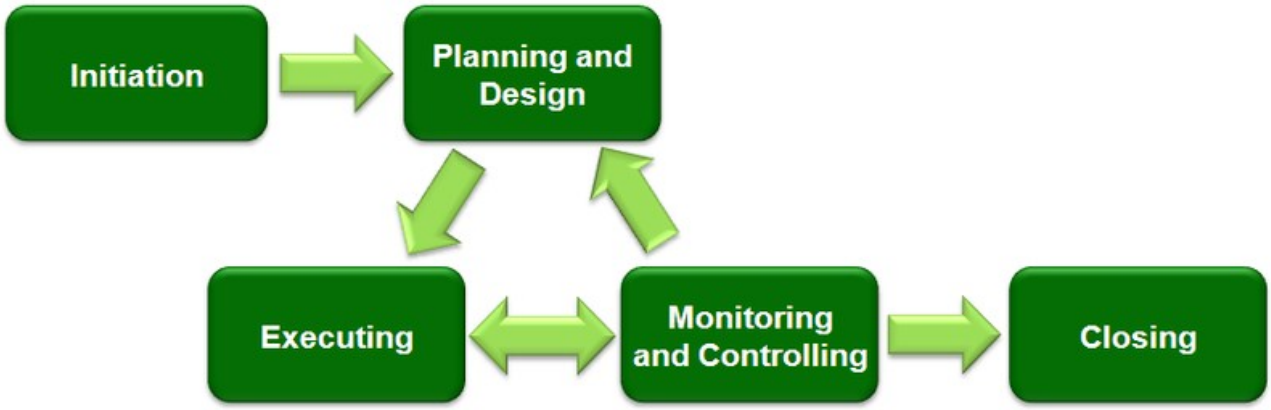
Projectmangement

Description according to literature
Project management is the discipline of planning, organizing, securing and managing resources to bring about the successful completion of specific project goals and objectives.
According to Wikipedia, a project is a temporary endeavor, having a defined beginning and end (usually constrained by date, but can be by funding or deliverables), undertaken to meet unique goals and objectives, usually to bring about beneficial change or added value. The temporary nature of projects stands in contrast to business as usual (or operations), which are repetitive, permanent or semi-permanent functional work to produce products or services. In practice, the management of these two systems is often found to be quite different, and as such requires the development of distinct technical skills and the adoption of separate management.

The primary challenge of project management is to achieve all of the project goals and objectives while honoring the preconceived project constraints. Typical constraints are scope, time, and budget. The secondary—and more ambitious—challenge is to optimize the allocation and integration of inputs necessary to meet pre-defined objectives.

A traditional phased approach identifies a sequence of steps to be completed. In the "traditional approach", we can distinguish 5 components of a project (4 stages plus control) in the development of a project:

1. Project initiation stage;
2. Project planning and design stage;
3. Project execution and construction stage;
4. Project monitoring and controlling systems;
5. Project completion.



(Wikipedia, 2011)

Phases of a project:
As mentioned in the article of Wikipedia the planning and phasing (step 2) is an important part of project management. The Smart Homes Foundation has classified home automation projects in phases, below is the description:

<u>Orientation Phase</u>
One house could be completed and made fully operational. Then, residents/users can learn about the (new or other) functionalities which in their home have not (yet) been activated. Developers can research which functionalities are actually wanted by users and how they should function or be operated. For this purpose Smart Homes has developed "the smartest house of the Netherlands" which is currently standing in the city of Eindhoven. This state of the art automated building can be dismantled and moved to new locations when needed. It serves

purposes of education, training, innovation, concept building.
It is constructed according to 4 main drivers:

- Home Automation
- Industrial – Flexible Building
- Sustainability (for example automated energy management)
- Woonkeur (a dutch benchmark about safety like breaking and entering/ personal safety, fitting needs of disabled people, accessibility and flexibility.

Design phase:
In many projects translating desired functionality into a technical program of requirements has not really taken place. The translation of an idea about what is possible with home automation to actual solutions that will be used is in fact often made by suppliers. It is often technology driven. As a result, a number of steps to achieve a balanced package of home automation applications have been skipped.
The output phase:
In completed projects many details can be found where the desired added value was not reached. An intermediary who assists the automation process with great attention to detail is extremely important for the success of an automation project. Features that seem logical or self explanatory to designers often baffle the end users.
Information phase:
The information on using the home automation system directed to residents, was mostly done verbally. The verbal information is usually not immediately processed properly. The moment people actually are going to use the home automation system, they have largely forgotten the instructions. The interviews showed that information must be easier to understand and that the use of visual resources should be increased.
Aftercare phase:
For projects that now exist for some time, the need to start replacing broken parts emerges. Again it is noticed that contracts often not foresee this and parts are hard and/or expensive to find or to replace.
(Erdtsjek & Bierhoff, 2007)

Supply and demand-driven implementation:
During our research we found that there are two types of home automation or implementing e-health solutions:
Supply driven: Solutions are based on the vendor offerings.
Demand driven: The needs of the end user is key, then look for an appropriate solution.

In "ICTzorg Magazine" Susan Buck wrote about this:

> "Many promising pilots die a quiet death because the applications are mainly technology driven and not designed from the perspective of the end-users."
> (Buck, 2008)

In a study commissioned by the Health Care Inspectorate Prof. Dr. van der Wal writes:

> "Too often, the technology is leading, without sufficient reflection on the implications for the quality of care, the system reliability, and the welfare and safety of the client."
> (Wal, 2008)

In a study of Fontys University, Eindhoven University and IRv/Vilans a possible cause is given:

> "Home automation is often designed and joined together by managers who are getting their advice from technical people."
> (Spondias Slee, Schouten, Bouwhuis, & Ward, 2007)

In the same study, the following conclusion:

> "The real users of home automation need to be involved in the development process as much as possible, to ensure a successful product that fits a human life."
> (Spondias Slee, Schouten, Bouwhuis, & Ward, 2007)

Smart Homes Foundation indicates that the solution is often selected from a technical

perspective:

> "In many projects translating desired functionality into a technical program of requirements has not really taken place. The translation of an idea about what is possible with home automation into actual solutions that will be used is in fact often made by suppliers. It is often technology driven. As a result, a number of important steps to achieve a well balanced package of home automation applications have been skipped. "
> (Erdtsjek & Bierhoff, 2007)

The magazine "ICTzorg" also agrees:

> "The most important point is that the user experiences that the application contributes to his quality of life. For example, in telemedicine the perspective of the care user often is lacking. The problem, the needs of the future user of telemedicine, first needs to be identified before an appropriate intervention using ICT can be determined."
> (Foroutanian, et al, 2007)

Collaboration among stakeholders

Within a project, there are different parties involved in developing a solution, often these are:

- The care organization, wanting to implement a home automation or e-health solution.
- A supplier, to provide or develop a solution.
- A government body, involved relating to grants.

Smart Homes Foundation writes:

> "Given the complexity of the innovative project at the organizational level a good project planning is a must. Mostly because of the innovative nature of the projects it is difficult to thoroughly estimate what is involved for the different parties. The project organisation and defining responsibilities is not always done properly. "

and

> "In pilot projects, it became clear that in many cases there was uncertainty about the contents of the cooperation. It is important to make good agreements with each party in advance, about the roles, interests (and the assurance thereof) and how each individual party will contribute to the success of the final product. "
> (Erdtsjek & Bierhoff, 2007)

Support and acceptance by both staff / specialists and end-user

In a study commissioned by the Health Care Inspectorate it says:

> "When purchasing equipment and medical devices, apart from the users also the instrumental department, infection control, the scope-disinfection employee and the occupational health expert should be structurally involved."
> (Wal, 2008)

Research shows that much of the technology that is introduced in the home environment, is experienced as very complicated and difficult to use. It is therefore important to look at the technology from the perspective of future users and to give those users the best possible support and information. In technology for elderly the following applies: The simpler the better: the ease of use must be considerable. Elderly prefer to use equipment they already know, e.g. the TV instead of a computer. The technology must fit into the everyday lives of users. A big mistake made by product developers and providers is that they often think that patients will eventually learn to live with their devices. Usually, with elderly this is not the case. Users of home automation equipment sometimes don't use the equipment available to them because they don't feel a constant need or urgency to do so. One example is the wearing of an emergency button around the neck. There may be insufficient support because the user does not understand the advantages or feel the necessity.
Training and education are often provided early in a project, but there is not always sufficient support and follow up in the long term. If the end user of an application does not understand it and does not know who they can turn to for support, the application will no longer be used. (Hettinga & Janssen, 2007), (Kiefer, 2007)

Smart Homes Foundation offers the following tips to ensure support and acceptance:

"It is important that not only the policy makers are convinced of the benefits, but that the users themselves are convinced of the benefits and that they are not hampered by technical barriers.

The following list of guidelines based on experiences can be drawn:

- Provide insight into the added value of the offered applications, the benefit to consumers should come first.
- Look at the applications in great detail to ensure yourself of the added value.
- Introduce features step by step.
- Document the sharing of responsibilities between the parties involved accurately.
- Ensure optimum ease of operation of the applications.
- Involve all parties in the information campaign.
- Next to oral, provide also written instructions.
- To ensure a long, smooth operation of the system you have to develop a thorough maintenance plan. Provide good service to handle problems of users. "
  (Erdtsjek & Bierhoff, 2007)

To prevent that solutions are introduced which end users will ultimately *not* be using ISG gives the following advice:

"Facts to be examined before introduction:

- The need for the product
- The benefits of this product to the users
- Variables that ensure the product will really be used
- Accessibility of the product
- The features it offers
- Possibilities for personification
- Social acceptance of the product "
  (Spondias Slee, Schouten, & Douw House, Effective use of smart home technology to increase wellbeing)

Case Study

Home automation for home care situations

By Charles Willems (IRv Knowledge Institute for Rehabilitation and Disability)

In collaboration with a lot of home care organisations in the Dutch province of Limburg more than 1100 clients are involved with service that is supported by various automation applications. The deployment of home automation improved efficiency and effectiveness of care.

They point out that they have benefited from the use of a process consultant:

- To implement and enforce the written agreements between parties, the process consultant looks after the interests of all parties involved.
- To maximise support and acceptance, the discovered thing run smoother with rigid control of a process consultant.

(Kiefer, 2007)

Failure and success factors

<u>Failure factors (Implementation and Projectmanagement):</u>

- Too little insight into the demands and wishes of the users (I):
  Supply-driven implementation has a high chance of failure, because the demands and wishes of the end user get insufficient priority. This results in a relatively high risk that a solution is chosen where the end-user needs are not met.

- Projects are difficult to manage (P):
  Because the projects often are of a complex and innovative nature is difficult to estimate what requirements are involved.

- Unclear division of responsibility between the project participants (P):

In the orientation phase, design phase, implementation phase and the aftercare phase there should be clear agreements between the parties. Often this is not addressed properly, or insufficient, thus there is more chance of a miscommunication or poor cooperation.

- Insufficient support and acceptance by staff / carers. (I):
  Employees within the organization are not always involved in the process, this can lead to resistance. This resistance can cause the failure of a project.

- Insufficient support and acceptance by the patient (I):
  Will the intended users actually use the solution?
  This is dependent on: usability, cost and importance of the solution (e.g. the reality or severity of the problem) / meeting the actual needs of the users. If this is not in order, users will not use it and the project fails.

Success factor (Project management):

- Scale through cooperation (P):
  Through cooperation instead of competition with other health care institution, upscaling becomes possible, resulting in lower prices.

The users

Description according to literature
The user in this case is the patient, the end-user who will be using the e-health and home automation.

For our research we focused on two age categories:
55-70 year old
70-plus
We chose these age categories because these people came most into contact with care. Also, they needed the most care, both home-care and residential.

However logical the needs of the patient may seem as a starting point, tele-health comes from a long history of supply-driven industry. Tjalsma:

> "Telemedicine often lacks the perspective of the care user. The problem, the question of the future user of telemedicine, first has to be identified before an appropriate intervention using ICT can be established. "(Foroutanian, et al, 2007)

Promising pilots often fail because the applications are mainly technology driven and are not designed from the perspective of end users. An approach directed to the end user – which can be both the care recipient as well as the care provider - can change this. The acceptance by the end user plays a major role: the increasing acceptance results in an increasing demand, a greater demand can set the grand scale implementation of telemedicine in motion. (Ploeger, 2009)

For acceptance it is necessary to have the end user clearly in mind at every stage: the concept development, product development and implementation of the application. (Buck, 2008)

Previous research by Nivel (Dutch research institute for healthcare) on telehealth in home care settings showed that institutions can hit two birds with one stone. Giving attention to more clients in less time, providing more care with fewer staff. And customers feel safer and less lonely, being able to make contact with a caregiver 24/7.

Hugo Koetsier - medical director of GGZ Noord-Holland-Noord (a regional mental care institution):

> "About the Project Remote Care I hear the same criticisms from social workers they had about the introduction of online therapy. There too was said that 'real' contact can never be replaced. Meanwhile the opposite is proven, clients sometimes find that they even have better contact with an e-consult. They dare to ask and tell more. "(Ploeger, 2009)

The cost aspect is important for clients and third parties such as distant relatives and acquaintances. Clients participate in a pilot that is free, but they are continually asking how high the cost will be after the pilot. Also additional costs play a role: equipment on standby will increase the electricity bill. (Hettinga & Janssen, 2007)

Case Studies
The following points were highlighted in a smal scaled interview that took place at the Service Center De Berke in Boekelo, the Netherlands, on March 29, 2007. The interviewees were five men and women
over 55 years old, all interested in telemedicine, all with an affinity with computers, some of them assisting a computer course for elderly.
Important questions on privacy according to these people: can someone always just look into your home through the camera? Who is looking at the other end?

One participant expressed the feeling that the care organisation is promoting this technology, but that it should be the users who need it.
Telecare can also lead to too much contact with a carer, which is not desirable (stalking, from loneliness).
Will family come to visit less often if they have a touch screen communication system?
Will the client receive a permanent caregiver? This creates trust and familiarity which is considered very important! (Hettinga & Janssen, 2007)

The following points emerged from another interview.
The interview was conducted with 80-plus years old. There were three men and one woman present. The participants are all quite vital. Their computer experience is limited, one person had a laptop at home with wireless internet, he is treasurer for a foundation and uses computers and the Internet for banking.
Remarkable results of the interview:
None of the people currently use tele-care services. Most interviewees are mobile and / or still live together and therefore feel no need for telemedicine.
Again the main message reads: "nice system this telecare, but not for us."
People with distant relatives show some interest in the social contact function. (Hettinga & Janssen, 2007)

Failure and success factors
<u>The failure factors (Implementation, Businesscase):</u>

- The user is not the starting point for the development of e-health and home automation. (I)

The concern for many years has been a supply-driven sector. This makes e-health and home automation also developed from the possibilities technology has to offer and not from the perspective of the user. Applications focus on the possibilities of technology.

- The application is not focused on what the user actually can use and which is easy to understand for the user (I)

- No clear cost to the user. (B)

During pilot projects, it is clear that the user has no additional costs of home automation and e-health. But once the pilot ends, it is not clear what costs are going to be made. And whether these costs are passed on to the user.

- Not clearly demonstrable added value of home automation and e-health for the user. (I)

Many users are put off by home automation and e-health projects, because they can not see the added value of home automation and e-health.

- Doctors see e-health and home automation as an erosion of care. (I)

Doctors see e-health and home automation as a threat to their expertise. They fear that these applications will make them redundant. Also, they indicate that communicating via e-health and home automation can not replace part of the normal visiting hours.

- Users are not involved in the development of e-health and home automation applications. (I)

Users who participate in pilot projects are not involved in the development of the services offered. They are taking part in a pilot where services have been developed, without them having had a say in it.

- Users do not know how to use e-health and home automation products. (I)

Users often have one single (mostly oral) explanation of the use of automation and e-health products. This single explanation will never be completely picked up. Several explanation sessions and clear written manuals of how the products should be used are a must.

<u>The success factors (Implementation, Businesscase):</u>

- Users see the social aspects of e-health applications very well: for example, contact with (distant) relatives, and the possibility to always connect with a care worker. (I)

- Clients sometimes find that they have better contact with an e-consult. They dare to ask more and tell. (I)
  Because people sit behind a computer, they feel free to ask and tell. This is because the social barrier is partly removed by a medium that is placed between them.

- Residents after some time automatically use features that they previously didn't feel they needed. (I)
  Research has shown that people who use e-health and home automation products in their home, also will be curious of other possible functions the products contain.

- Clients are willing to pay for home services as an added value is demonstrated to them or (even better) experienced by them. (B)

- Security applications are of the greatest importance to users (burglar alarm, telephone care, personal alarms), followed at great distance by ease of use. However it is indicated in several projects that a product that is difficult to use or is easy to misuse (creating false alarms) will be used not at all or will be removed by the user. (I)

Laws and regulations

Description in Literature
In the field of law and regulation, little is defined on E-health and home automation. However, in the Dutch literature on E-health and home automation some contributions on this theme can be found.

Smart Homes and fix telematics say the following:

> Current regulations have little flexibility. The legislation is not set on innovative concepts. This is partly reflected by the fact that the legislation lags behind technological capabilities and also ignores the joining of worlds governed by different rules. The latter is very restrictive because the true power of automation projects is in bringing together different worlds and the added value that is created this way. Added value not only for end users, but for the entire chain of care giving and thus also for a business case.
> (Erdtsjek & Bierhoff, 2007)

It is therefore important to find out what these worlds exactly are and why they mismatch. Below a concrete example of a clash between these two worlds:

> An example of contradictory regulations can be found on the interface between CCTV and personal alarm equipment. About CCTV much attention is given to privacy issues, it is based on random observation in public areas. For alarm equipment, dealing with private situations and emergencies, specific regulation was established, which is completely separate from privacy legislation (Akkermans, van Dijk, Prince & Samson, 2004). Regulations can not only be contradictory between each other but also differ by region. A study of Fokus Projects (special independent living houses for people with severe physical handicaps) revealed big differences in safety requirements made by local or regional fire departments. (Erdtsjek & Bierhoff, 2007)

So bringing together technology from different worlds (e.g. healthcare and public safety) and because of a lack of national legislation (like with the rules for fire safety) we find lots of legislative steeples on our path of introducing integrated systems of home automation. Dutch housing associations for example would like to combine these home automation systems with automated fire detection. But it is not allowed to switch these systems directly to the fire department, because they are not independent systems. And it is mandatory to have directly switched fire detection in apartment buildings for elderly. So they are required to install two systems, undermining the businesscase for home automation.

When asked the users themselves have quite different perspectives on for example privacy. In the example below, it is said that privacy is perceived as having an exchange relationship with feeling safe in your own home.

> A remarkable conclusion is also that privacy in practice is perceived very different by the residents. By the very fact that the staff of the care center becomes less anonymous by the deployment of services and technology (they appear on screen with their face), the feeling of invasion of privacy is greatly reduced to residents. Privacy is seen by residents as an exchange relationship. (Erdtsjek & Bierhoff, 2007)

Safeguarding privacy and the bringing together of different worlds are the main obstacles in the field of legislation and regulations. Therefore, our further research focuses on this.

In the example below it is shown that by establishing clear protocols associated with the functionality, privacy can be guaranteed.

> Innovative concepts also demand innovative solutions. For example, by preparing protocols within a project regulations can be met, without compromising on functionality. In the project VieDome privacy, despite the use of cameras, is guaranteed

> by means of the residents themselves must take the initiative to make contact. Privacy in this project is also described as an exchange relationship. (Erdtsjek & Bierhoff, 2007)

In Viedome normally the patient is the one switching on the camera. In emergency situations there is a protocol that is signed by the patient. The emergency switchboard worker has to ask the resident if there is an emergency (through a two way audio connection) and wether they are allowed to switch on the camera. If there is no answer at all, according to the protocol they can switch on the camera.

The example below shows how changes in regulations also can influence the business model.

> Regulatory changes can have a major impact on the business model. The fact that screen-to-screen care will be reimbursed by the Dutch health care act for example, is important for the project Telesens. (Erdtsjek & Bierhoff, 2007)

Prismant is a business service for the Dutch health care and in their paper "E-health and home automation in healthcare: opportunity or risk" they describe a set of solutions to assure privacy they have found in other sources.

> Prismant considers it her mission to support her customers in formulating, implementing and evaluating their policies aimed at improving efficiency, effectiveness and quality of care.
> (Velde, Cihangir, & Borghans, 2008)

Below are step by step the various solutions regarding invasion of privacy, Prismant found in their literature study. (Velde, Cihangir, & Borghans, 2008)

> Applications should be limited to what benefits the client. These ideas must be discussed with clients, families and staff (College Bouw Zorginstellingen (Dutch Board for Building for Health care), 2006). Hofschreuder puts it: Privacy invading applications should only be used if strictly necessary and with the consent of the resident (Hofschreuder, 2006).
>
> This was mentioned in a publication about the physically disabled, but can also be extended to other sectors. Bierhoff and Kröse indicate that more consideration should be given to what technology is deployed, the question should be asked whether a particular desired functionality can only be achieved with cameras. Locating patients by ultrasonic sensors is for example, less privacy invasive than cameras (Bierhoff and Kröse, 2006);
>
> Clear protocols on the use of technology are of vital importance: who is watching / listening / registers when and why (de Jong and Art, 2005), (Willems and Willems, Schutgens, 2007a), (Bierhoff and Kröse, 2006), (Vermeulen and Kools, 2005)
>
> Clearly indicate to patients what is recorded, how the recordings are saved and when they will be destroyed (Bierhoff and Kröse, 2006) (College Bouw Zorginstellingen, 2006)
>
> Log the use of cameras and sensors (by whom and why, frequency and duration) to prevent unnecessary use and, to prevent abuse of technology and data (de Jong and Art, 2005), (van der Leeuw, 2007)
>
> Ask the consent of the client (Bierlaagh, 2005) or his family if clients themselves are not capable (College Bouw Zorginstellingen, 2006)
>
> Let the resident take the initiative to establish a contact as a guarantee of privacy (College Bouw Zorginstellingen, 2006), (Bierhoff and Kröse, 2006), (Vermeulen and Kools, 2005). This applies particularly to the use of technology in the private homes of people.
>
> Camera only switched on after consent of the client. Enabling cameras in the care

situation may also be linked to a certain noise level (threshold) of an acoustic listening system and only after permission of the occupant it can be used together with a camera (de Jong and Art, 2004).

An indicator that shows if video is enabled (Willems and Willems, Schutgens, 2007a). This was mentioned in a publication about the physically disabled, but can also be applied in other industries.

In audio-visual connection, the client must be able to turn off the video (Vermeulen and Kools, 2005): an audio-visual system would have to have a key to switch the camera off. This suggestion was made for use in home care but can also be applied in other sectors.

The camera model also affects the degree of invasion of privacy. A camera with fixed-angle image that covers an entire room (fish-eye camera) gives little detail, but the necessary information about the situation. The other extreme is a high resolution, remote-controlled camera (van der Leeuw, 2004). If only the silhouette is passed, privacy is less affected (Bierhoff and Kröse, 2006)

If the caregiver is also visible, the sense of invasion of privacy becomes less. This was shown by a number of projects in private home settings. Privacy is seen as an exchange relationship. Moreover, there is a difference between how researchers and caregivers understand privacy (they have much attention to the privacy issue) and how users are experiencing it (not experiencing an invasion of privacy) (Bierhoff and Kröse 2006).

Upon transfer of information, privacy laws must be taken account. With the deployment of a central alarm post for alarms transfer of information is inherently necessary. This should take account of such privacy legislation (SIGRA, 2005).

In case of the exchange of information, the personal data must be well protected (Bierhoff and Kross, 2006); (Nouws and Sanders, 2006a).

RFID must only be applied where it is socially and morally acceptable and legally permitted (European Economic and Social Committee, 2007).

RFID applications should be transparent to stakeholders (European Economic and Social Committee, 2007).

(Velde, Cihangir, & Borghans, 2008)

What we found so far in the literature is that most problems in terms of laws and regulations are related to the lack of privacy for the residents or users. All described solutions are designed to secure privacy.
The solutions we just described enhance the privacy and can therefore be seen as success factors. In the chapter on failure and success factors many of these solutions will be highlighted again.

Case Studies
No practices found.

Failure and success factors
<u>The failure factors (Implementation):</u>

- The legislation is not set on innovative concepts (I)

This was concluded by Smart Homes in its final report that describes how the combination of different worlds (different origins of technology and difference between care and technology) is difficult.

- The legislation is lagging behind on technological capabilities (I)

According to the literature, many e-health and home automation projects are technologically innovative projects where existing regulations are not consistent with the new technologies that are being used.

- The regulations may vary by region (for example with fire department regulations) from which confusion may arise (I)

The final report on home automation (Erdtsjek & Bierhoff, 2007) gives an example of how regulation varies across regions.

- The regulations can be contradictory (I)

The final report on home automation (Erdtsjek & Bierhoff, 2007) See previous chapter

<u>The success factors (Business case):</u>

- The residents see privacy as an exchange relationship (B)

The exchange relationship is possible if the caregivers also give a portion of their privacy in return. Also users are prepared to give up a little privacy in return for personal safety.

- Regulatory changes may affect the business model when it makes that certain technology may be compensated. Also negative effects are possible, if legislation prohibits the use of information for different needs (like using the information from fire detectors who are a part of home automation system, in stead of a stand alone system) (B)

Conclusion

A lot of the Dutch literature on this subject was used and we found similar succes and failure factors in different sources.

- We have determined that the implementation phase contains the most success and failure factors: 16 failure factors and 9 success factors were found in this category.
- Subsequently, the business model showed 6 failure factors and 3 success factors.
- Finally, project management method showed 2 failure factors and 4 success factors.

All these success and failure factors should be considered important input for business cases and project plans. It also underlines the importance of the TCares project trying to emphasize the needs of users in stead of the possibilities of technology. Also the other factors identified are pillars of the TCares project such as the importance of training for users and care workers and the importance of making a sound businesscase before investing in telehealth, telecare or home automation.

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