

# BENEFITS OF MOBILE REPORTING SYSTEMS IN SOCIAL HOME CARE: THE CASE OF SEVEN SWEDISH MUNICIPALITIES

Shengnan Han, Gustaf Juell-Skielse, Åsa Smedberg, Parisa Aasi, Anders G. Nilsson  
Department of Computer and Systems Sciences, Stockholm University

**Objectives:** Mobile systems are widely adopted in healthcare services. Mobile reporting systems have been recently introduced for social home care by municipalities in Sweden. The study aims to assess the benefits of using these systems.

**Methods:** We followed an expert survey approach. Data were collected by means of telephone interviews with the experts in charge of managing and implementing the systems at the municipalities. In addition, several workshops were organized for assessing the economic value of the systems at one municipality. We performed thematic analysis and cost-benefit analysis of the data.

**Results:** The thematic analysis showed the three main benefits of using the mobile reporting systems in social home care: municipal benefits, care providers' benefits, and care recipients' benefits. The cost-benefit analysis indicated that the systems could bring substantial long-term economic value for municipalities. The results also revealed the difficulties encountered at the early stage of the deployment and implementation of the systems.

**Conclusions:** The mobile systems yield benefits for all the actors, that is, municipalities, care recipients and care providers. These enhance the public-private coordination and cooperation in social home care in Sweden. The municipalities are called upon to address change management and technical challenges in the implementation.

**Keywords:** Technology assessment, Benefits, Mobile systems, Social home care

Home care in Europe is currently in a phase of great change. One such change concerns the fact that the population is aging, which entails coverage of many different needs and concerns. Together with older adults, there are other groups of people, like disabled and long-term sick people, who are in need of daily home care. Knight and Tjassing (1, p.16) define home care as “an array of health and social support services provided to clients in their own residence. Such coordinated services may prevent, delay or be a substitute for temporary or long-term institutional care.” In this article, we focus on the social support services managed by the municipalities in Sweden. We refer to it as “social home care”.

Social home care in Sweden offers domestic aid in the home of the recipients including services like laundry, cleaning, daily shopping and personal assistance and care. Social home care typically requires that care providers with different specialities are involved, private as well as public ones. The first goal regarding providing social home care services in Sweden, is aging in place, defined as remaining at home as long as possible for the old people and receive their needs by the organizations who deliver services at home (2). The second goal is to assist the relatives who take care of their older or disabled family members at home (2).

The 290 municipalities in Sweden are responsible for the social home care of the residents. They paid 125 million Euro on social home care services in 2012 (3). Additionally, the population of older adults composes a large part of social home care recipients and this group is expected to increase to 30 per cent of the Swedish population by 2030 (4). Therefore, to be able to continuously provide quality services for the growing number of home care recipients, the municipalities put great effort into developing more effective processes and to reduce costs. New information technology (IT) tools, and specifically mobile systems, have recently started to be used to solve some of the problems in relation to social home care (5–9).

In 2009, Sweden introduced LOV (*Lagen om valfrihetssystem*, in Swedish), which is Act on free choice systems; all municipalities are expected to implement it fully by 2014 (10). According to LOV, care recipients have the opportunity to select among different private or public social home care service providers and the municipalities prepare and pay the services through the recipients' choice. Consequently, the social home care process is changed and integrated with the requirements of LOV (Figure 1).

This new process introduces challenges for municipalities to control and coordinate social home care services. While outsourcing social home care, municipalities are still responsible for service quality and the safety of the care recipients; hence, they need to establish new control and cooperation mechanisms. Mobile reporting systems are used in this process and aimed

We thank Diana Barcikowska for her research assistance in the data collection. We also thank the two reviewers and the associate editor for their valuable comments to improve the manuscript.

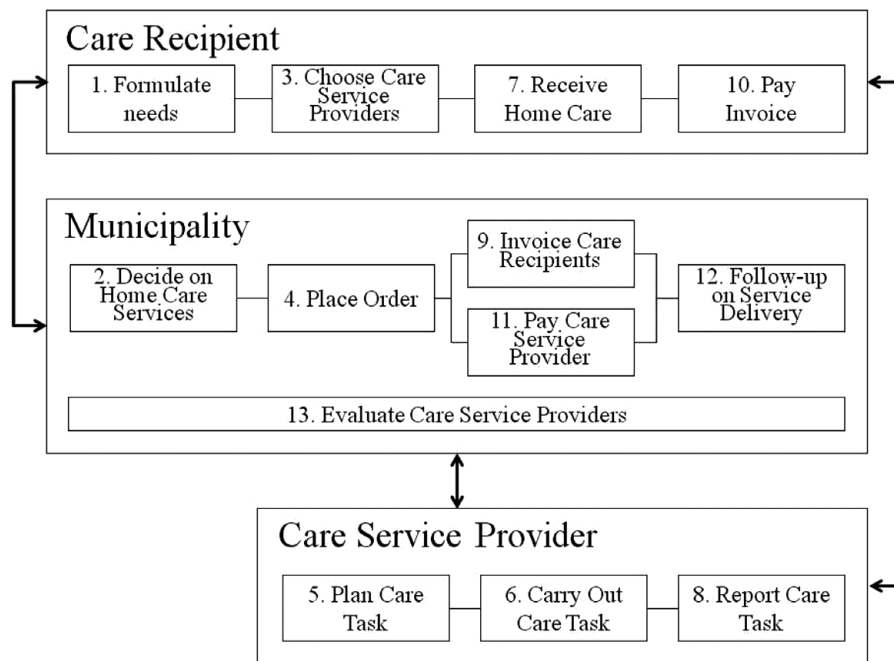


Figure 1. The new social home care process integrated with LOV.

at facilitating these mechanisms. The two popular mobile reporting systems (hereafter, the mobile systems) in the Swedish market are Mobipen and Intraphone. Mobipen is a digital pen that includes scanner functionality, and the care personnel use it to scan and store information when visiting the home of the care recipient. A barcode on the doorframe of the recipient's home lets the care personnel scan and store the time of arrival and departure. While providing the different care services, information about the services and times of their execution is also stored in the digital pen. Once the worker is back at the office, the pen is docked into a system and the information is passed on to the back office system for statistics and analysis (11). The Intraphone is a smart phone application with more functionality embedded, such as search of recipients, diary and automatic transfer of information to the back office system. Mobipen is currently used in more than 40 Swedish municipalities (12), and Intraphone is used in 32 municipalities (13).

This study describes the benefit assessment of the mobile systems. The benefit analysis is performed by investigating the experts' opinions, experience and knowledge of using the systems in social home care in the municipalities in Sweden. It provides insight into the benefits of the systems for the municipalities, care providers and care recipients, and pinpoints the challenges of implementation.

## METHOD

In this study, we follow the expert survey approach. Meyer and Booker (14) claim the benefit of using experts in empirical studies is that they can provide “valuable and reliable information on the state of knowledge in their field, on how to solve prob-

lems, and on the certainty of their answers” (14, p. 18). Data were collected over a 5-month period in 2011–12. First, we conducted an Internet search to find the fifty municipalities that had implemented the mobile systems in social home care. Second, we searched the contact information of the experts in charge of managing and implementing the systems in the municipalities, for example, elderly care manager, IT manager, project leader, system administrator, and the directors for social home care. Third, we sent out emails to these experts, in which we explained the aim of the study and asked if they could contribute information. We got answers from six experts from the municipalities of Lomma, Örnsköldsvik, Östra Göinge, Gislaved, Sollentuna, and Mariestad. We then booked the time for telephone interviews with each expert. The interviews were semi-structured and lasted for 30 to 40 min. The questions were focused on the benefits and challenges of the mobile systems in social home care. The interviews were recorded and transcribed for data analysis. The experts' names were kept anonymous (Supplementary Table 1, which can be viewed online at <http://dx.doi.org/10.1017/S026646231400052X>).

In addition, to assess the economic value of the systems, we organized several workshops in the municipality of Järfälla. The purpose of these workshops was to gather more quantitative data regarding the costs and benefits of initiating and implementing the mobile system, that is, Mobipen. Five experts from the municipality in the areas of social home care and IT participated in the workshops.

We performed a thematic analysis of the qualitative data we collected in the interviews. One of the advantages of the method is that it is suitable for producing qualitative analyses of informing policy development (15). The method has six steps in

**Table 1.** Municipality Background Information

Municipality	Population Elderly (%)	Application Usage of the system (%)	LOV & private care providers (%)	65+ received home care in the ordinary home (%)
Lomma	22301 (20.3%)	Mobipen (100%)	yes/about 50%	5.8%
Örnköldsvik	54953 (23.0%)	Mobipen (25%)	yes/n.a.	8.1%
Östra Göinge	13628 (22.7%)	Mobipen (25%)	No	7.8%
Gislaved	28730 (19.4%)	Mobipen (100%)	No	9.6%
Sollentuna	66679 (15.1%)	Mobipen (100%)	yes/ about 50%	10.9%
Mariestad	23697 (24.8%)	Intraphone (100%)	No	n.a
Järfälla	68123 (17.4%)	Mobipen (initative)	yes/ n.a.	11.9%

*Note.* Population is the number by 1 November 2012.

n.a., not available.

the data analysis process, which are: familiarization with data, generating initial codes, searching for themes among codes, reviewing themes, defining and naming themes, and producing the final report. The first three steps were completed by two of the authors. To ensure reliability and validity of the results, the team did the last three steps jointly. The consensus and agreements in interpretations were achieved through discussions and working meetings among the team.

The cost-benefit analysis was further performed for the quantitative data gained from Järfälla. Cost-benefit analysis is a systematic process for calculating and comparing monetary benefits and costs of a project, decision or government policy (16). This method is applicable for the study because the municipality would make the decision for implementing the mobile systems.

## RESULTS

Table 1 shows the background information of the municipalities that were involved in the research. Six municipalities had implemented Mobipen and one used Intraphone in their social home care services. Five municipalities implemented the mobile systems fully in social home care, and two had limited implementation, that is, 25 percent. LOV was introduced in four municipalities, and 50 percent of their social home care services are outsourced.

### Thematic Analysis of Benefits

The thematic analysis showed that there are three main categories of benefits of using the mobile systems in social home

care: municipal benefits, care recipients' benefits, and care providers' benefits (Figure 2).

**Municipal Benefits.** By implementing the mobile systems in social home care, the municipalities gain several benefits. First, they get the benefits of an improved time reporting process. The process is simplified and standardized by the use of digital and real time reporting at the sites of service delivery. One expert stated, "we have got rid of double documentation from paper-based reporting to digital reporting and from back-office reporting to real time reporting." Also, the mobile system is integrated with the back-office system, which eliminates data redundancy. Second, municipalities obtain the benefit of reduced costs for care service delivery and municipal administration. The cost is reduced because the exact working hours are reported in the system. The municipalities do not pay for care providers' other activities, for example, travel time, meetings, or education. Because the reporting is completed at the sites of service delivery, reporting errors are largely reduced. The municipalities have less administrative cost for handling report deviations and questions from care recipients and their relatives. The cost is further reduced through outsourcing the services to private service providers. Hence, economic synergies are enabled. Third, the benefit of ensured social home care quality and supervision is achieved. The municipalities increase the control of alignment between orders, delivery and time reports. Two experts commented "the system allows for better control of the execution of the decided services, and time spent at the home of the recipient. It helps in securing the quality." Fourth, the mobile systems facilitate a better coordination between the municipalities and

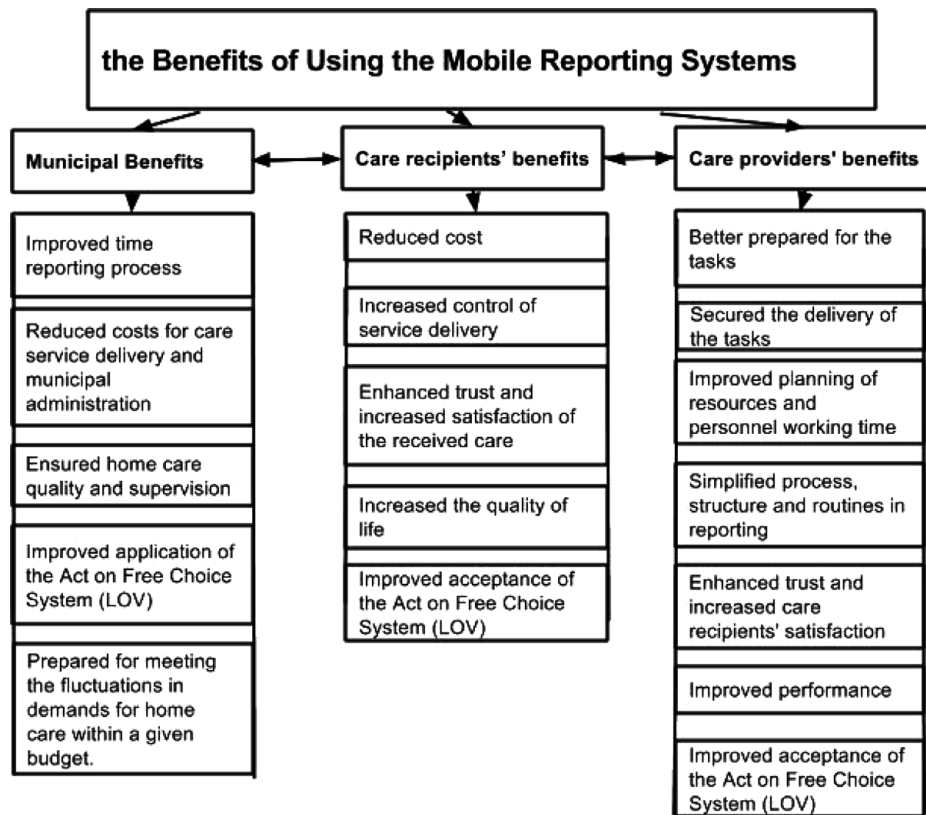


Figure 2. The thematic map: The benefits of using the mobile reporting systems.

private care providers. This motivates the municipalities to apply LOV in the services. Finally, the municipalities argue that the systems help them to become better prepared for meeting the fluctuations in demands for social home care within a given budget.

**Care Recipients' Benefits.** Care recipients also benefited from the use of the mobile systems, such as, having reduced costs, increased control of service delivery, enhanced trust, improved acceptance of LOV, and increased quality of life. As we mentioned above, the systems record the exact working time that the recipients pay for, hence, the cost of receiving social home care is significantly reduced. The information stored in the mobile systems is communicated between the care providers and the recipients at the sites of service delivery, one expert pointed out “care recipient can be guaranteed that care personnel will be on time, on place as well performing the desired tasks,” which indicated that the recipients’ control of the services was increased. Such communication is also beneficial for enhancing trust and increasing satisfaction of the recipients. One expert explained, “the risk for misunderstanding between care personnel, recipient, and his or her family or relatives is reduced.” All these benefits further motivate care recipients to fully accept LOV, with the aim of increasing the quality of life.

**Care Provider Benefits.** The care providers achieve more benefits than other actors by using the mobile systems. First, they are better

prepared for the assigned tasks and for securing the delivery. In real time, care personnel can check and clarify the tasks that they should carry out at the recipient’s home. Second, they report directly right after the tasks are completed by using Intraphone, this promotes accuracy and reduces the deviation between the pre-assigned tasks and the exact service delivered. Third, the providers can improve the planning of resources and personnel working time. All the service assignments from the municipalities are stored in the system. One expert stated “we can assign resources where they are needed.” Fourth, the use of the system simplifies the reporting process from the care providers to the municipalities’ back office systems. “We don’t have to send reports through the internal mail system” one expert explained. Fifth, the new social home care process is integrated with LOV, which gives private home care providers more opportunities to co-operate with municipalities, and to build good relationships with care recipients. This generates the benefits of enhanced trust and increased care recipients’ satisfaction and improved acceptance of LOV. Finally, the use of the systems increases the transparency in the social care process, this, in turn, helps the competitive service providers to reveal good performance, i.e., the benefit of increased performance.

**Challenges.** The findings also revealed the challenges encountered during the early stages of deployment and implementation. First, the mobile systems sometimes did not work properly. Most of the interviewees complained about the bad quality of the

**Table 2.** Cost-Benefit Analysis of Using Mobile Reporting System (in Euro)

Year	2012	2013	2014	2015	2016
Level of usage	5 %	75 %	100 %	100 %	100 %
Administrative savings	0	6 616	24 809	33 078	33 078
Decrease of home care costs	203 515	2 771 244	2 811 301	1 873 872	879 458
Cost of information system	−285 523	0	0	0	0
Project costs, internal and external	−285 523	−285 523			
Annual service costs	−56 233	−56 233	−56 233	−56 233	−56 233
Cash flow	−423 764	2 436 104	2 779 877	1 850 717	856 303
<b>Net present value</b>	<b>6 500 375</b>				
Cost of capital	4.5%				

*Note.* The itemization of the costs and benefits is shown in Supplementary Table 2.

systems, which caused frustration when using the systems. Second, the mobile systems are designed to integrate with the back office systems. However, the integration did not function smoothly in the beginning which forces care providers to use manual reports instead. Third, the systems are new to the care providers, thus they have to learn to use them correctly. Municipalities have to offer a lot of training to increase the care providers' knowledge and competence in adopting the new systems. Fourth, the introduction of mobile reporting practice changes the established working routine. This in turn leads to resistance from the care providers. As an expert said “we have to clearly explain that the mobile system is aimed for ensuring quality and for distributing resources.”

#### Analysis of Municipal Costs and Benefits

The cost-benefit analysis was based on the data from the municipality Järfälla, which evaluated an initiative to implement Mobipen. The analysis included benefits and costs estimated in Swedish Krona (SEK), then converted to Euro over a 5-year period (2012–16) (see Table 2 and Supplementary Table 2, which can be viewed online at <http://dx.doi.org/10.1017/S026646231400052X>). The cost of capital used by the municipality was 4.5 percent. Systems implementation costs were calculated based on a proposal from an IT-supplier in combination with standard costs for IT-projects used by the municipality. The usage level of the system was estimated to be 5 percent the first year, 75 percent the second year, and reaching full adoption in the third year. The administrative savings were estimated based on the level of usage and would not reach full savings until the fourth year. There is a social home care service fee for care recipients. One-hour cost was approximately 9 Euro in 2012, this increased to 17 Euro in 2013. However, the fees are normally subsidized due to low incomes and the total invoiced hours are only 16 percent of the total delivered hours. In addition, the reimbursements of service providers were expected to

increase from 35 Euro per hour in 2012 to 39 Euro per hour in 2016.

Based on the above assumptions, the net present value of the investment in the Mobipen system was calculated to be 6.5 million Euro. During the 5-year period, the need for social home care will increase by 4 percent per year. However, the decrease in costs for social home care services will be greater. Thus, the investment in the Mobipen system will both finance the increasing needs for social home care services and bring a positive return of the investment.

#### DISCUSSION

This study shows that the use of the mobile systems in social home care has made a big impact on the social home care process and its service quality. The systems have generated positive and highly interrelated benefits for all actors (Figure 1). The challenges in the early stage of system implementation are also recognized.

The time reporting process is significantly improved. The municipalities can assign and control the care tasks and delivery; the care providers can be better prepared and create better plans for the tasks and desired resources. This also secures the delivery of the services. Moreover, the care recipients can control the tasks at home and get the desired services. Furthermore, the real time reporting ensures accuracy in reporting. This alleviates the administrative work of municipalities and promotes the performance of the care providers.

Municipalities and care recipients reduce their cost for home care because the mobile systems are able to record the exact working hours by care providers at the site of services. No other costs are included in the service payment. In addition, for municipalities, the administrative cost is dramatically dropped, whereas, the long-term economic value is considerably obtained (Table 2).

The mobile systems enable and facilitate a better public-private coordination and cooperation in the social home care

process, which largely diminishes the challenges of the application of LOV and outsourcing home care services to private providers. Ultimately, the competition and transparency in the social home care services would encourage and motivate all the care providers, both private and public, to increase their performance. Connolly, McKeown and Miligan-Byrne (17, p.24) state, “the choice between competing providers is seen as the best spur to improve the quality.”

Social home care services in Sweden are aimed to fulfill two fundamental goals (2). The results advocate the fact that, by using the mobile systems, the goals can be achieved in the future, that is, increasing care recipients’ life quality, and ensuring the quality of social home care within limited resources.

To conclude, our findings advance knowledge of IT usage and adoption in the public service. The key contribution of the research is the richer understanding of the benefits of the mobile systems in new contexts, that is, the context of Sweden, and the new social home care process. The thematic analysis of the experts’ survey and cost-benefit analysis were systematically performed and yielded comprehensive results of the research. The results are indeed useful for guiding the public organizations in assessing the use of IT solutions, especially, mobile systems for their services.

Our findings are limited to two mobile reporting systems: Mobipen and Intraphone with the experts from seven municipalities. More research is needed to assess the benefits of other similar systems that are adopted by other municipalities. The research was conducted in Sweden, which has its unique social and political system, thus, the generalization of the results to other contexts may be limited.

Similar studies can be conducted in other settings and in other countries for a comparative review.

## POLICY IMPLICATION

The results clearly demonstrate the benefit of using the mobile systems in the social home care as well as in helping the municipalities to integrate LOV in the process. We recommend more municipalities adopt and implement the systems in the near future. However, municipalities are called upon to address the change management and technical challenges in implementation. A better dialogue and communication among the municipalities, care providers, and care recipients will improve the collaboration in the changing process and ensure the sustainability of the systems.

## SUPPLEMENTARY MATERIAL

Supplementary Table 1:

<http://dx.doi.org/10.1017/S026646231400052X>

Supplementary Table 1:

<http://dx.doi.org/10.1017/S026646231400052X>

## CONTACT INFORMATION

**Shengnan Han, DSc** (shengnan@dsv.su.se), Associate professor, Department of Computer and Systems Sciences, Stockholm University, Postbox 7003, 164 07, Kista, Sweden

**Gustaf Juell-Skielse, PhD** (gjs@dsv.su.se), Associate professor, Department of Computer and Systems Sciences, Stockholm University, Postbox 7003, 164 07, Kista, Sweden

**Åsa Smedberg, PhD** (asasmed@dsv.su.se), Associate professor, Department of Computer and Systems Sciences, Stockholm University, Postbox 7003, 164 07, Kista, Sweden

**Parisa Aasi, MSc, PhD candidate** (parisa@dsv.su.se), Department of Computer and Systems Sciences, Stockholm University, Postbox 7003, 164 07, Kista, Sweden

**Anders G. Nilsson, PhD** (agn@dsv.su.se), Professor, Department of Computer and Systems Sciences, Stockholm University, Postbox 7003, 164 07, Kista, Sweden

## CONFLICTS OF INTEREST

All authors have no conflicts of interest to declare.

## REFERENCES

1. Knight S, Tjassing H. Health care moves to the home. *World Health*. 1994;4:413-44.
2. Torres S, Hammarström G. Successful aging as an oxymoron: Older people—with and without home-help care—talk about what aging well means to them. *Int J Ageing Later Life*. 2009;4:23-54.
3. Scb.se. *Kommunernas finanser 2012 ny* [Internet]. Stockholm: Statistiska Centralbyrån Statistics Sweden. <http://www.scb.se/sv/> (accessed June 11, 2014).
4. Sweden.se. *Elderly care: A challenge for our future* [Internet]. Stockholm: Swedish Institute; c2013–2014 [updated March 25, 2014]. <http://www.sweden.se/eng/Home/Society/Elderly-care/Facts/Elderly-care/> (accessed June 11, 2014).
5. Bricon-Souf N, Anceaux F, Bennani N, Dufresne E, Watbled L. A distributed coordination platform for home care: Analysis, framework and prototype. *Int J Med Inf*. 2005;74:809-825.
6. Camarinha-Matos LM, Vieira W. Intelligent mobile agents in elderly care. *Robot Auton Syst*. 1999;27:59-75.
7. Lind L, Karlsson D, Fridlund B. Digital pens and pain diaries in palliative home health care: Professional caregivers’ experiences. *Med Inform Internet Med*. 2007;32:287-296.
8. Nilsson C, Skär L, Söderberg S. Swedish district nurses’ experiences on the use of information and communication technology for supporting people with serious chronic illness living at home – A case study. *Scand J Caring Sci*. 2010;24:259-265.
9. Maglaveras N, Koutkias V, Chouvarda I, et al. Home care delivery through the mobile telecommunications platform: The citizen health system (CHS) perspective. *Int J Med Inf*. 2002;68:99-111.
10. Lagen om valfrihetssystem- LOV [Internet]. *Sveriges Kommuner och Landsting*. [updated June 2, 2014]. [http://www.skl.se/vi-arbetar\\_med/valfrihet/valfrihetuppdrag/lag\\_om\\_valfrihetssystem](http://www.skl.se/vi-arbetar_med/valfrihet/valfrihetuppdrag/lag_om_valfrihetssystem) (accessed June 11, 2014).
11. Weihe G, Højlund S, Holljen ETB, et al. *Strategic use of public-private cooperation in the Nordic region*. Copenhagen: Nordic Council of Ministers; 2011.

12. PASHealth Mobipen [Internet]. *Patient Access Solutions, Inc.*; c2010. <http://www.pashealth.com/mobipen.html> (accessed October 17, 2014).
13. Intraphone [Internet]. Intraphone International BV; c2013–2014. <http://www.intraphone.com/en/> (accessed June 11, 2014).
14. Meyer MA, Booker JM. Eliciting and analyzing expert judgment: A practical guide. *SIAM*. 1991.
15. Braun V, Clarke V. Using thematic analysis in psychology. *Qual Res Psychol*. 2006;3:77-101.
16. Boardman AE, Greenberg DH, Vining AR, Weimer D. *Cost-benefit analysis*. Upper Saddle River, NJ: Prentice Hall; 2010.
17. Conolly M, McKeown P, Miligan-Byrne G. Making the public sector more user friendly? A critical examination of the citizen's charter. *Parliam Aff*. 1994;47:23-36.