The Inertia of the Status Quo:

A Change Management Analysis of Technological Innovation

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***Abstract*—A reanalysis of the lack of acceptance of an ehealth data records system utilizing the tenets of change management reveals fundamental issues surrounding the challenges facing the introduction of new technologies in health care. Even though the design of the system was largely driven by the end-users themselves, ultimately these same individuals rejected the system once a series of pilot studies ended. The findings from these studies suggest that the key element for the successful introduction of a new technology is the necessity to overcome the inertia of people not wanting to change how they do their jobs, not the technology itself.**

Keywords*—*acceptance of innovative technologies, change management, an ehealth data records system

I. INTRODUCTION

This article is an example of the reason that one presents papers at professional meetings: being pushed into expanding one's analysis because of questions being asked that one cannot answer. In this case, it was a question posed in Barcelona at eTELEMED 2014: "isn't your work an example of the process of change management?" Although unable to answer the question at the time, the most cursory research into change management allowed the answer to be an emphatic yes. However, that simple answer led to a rethinking of the process on which the eTELEMED paper, "If they designed it, why don't they want it? The lack of acceptance of an ehealth data records system" [1], was based with the result being a much expanded analysis and a greater understanding of what on the surface was a largely inexplicable failure of adoption of a wireless ehealth data records system for use in the delivery of care and services in the residences of at-risk elderly individuals.

This particular wireless ehealth data records system was developed as a response to the desire on the part of governments, in most industrial countries, to introduce electronic health care records systems and to the dramatic increase in the amount of care and services being delivered in residences. Although the use of electronic health records systems has been one of the major initiatives in the United States as well as in most European countries for much of the 21st century, the actual adoption of ehealth records systems has been much slower than anticipated. This is the case even though the United States "government set aside $27 billion for an incentive program that encourages hospitals and providers to adopt electronic records systems" [2]. Although there is some debate over the reliability of ehealth records systems [3], there appears to be little doubt that the greater the ease of storage, access and cost savings will eventually achieve close to universal usage within institutions and among physicians [4][5]. If the pace of adoption in hospitals and physician practices has been slow, the pace of adoption of ehealth data systems for use to chronicle care and services in the home has been even slower. There is little debate that the delivery of care and services in the home has increased significantly and will accelerate at an ever more rapid pace over the coming several decades because of two basic factors: demography and cost. The demographic trends are well known: dramatic increase in the number of elderly, especially the oldest-old; a concomitant increase in chronic diseases associated with aging; and a decline in the number of family members who can provide care. Cost projections are similarly daunting: increasing cost for care delivery within the institutional setting; insufficient number of institutions and insufficient funds to build the large number of additional institutions; and prohibitive costs to government to provide care and services through current care delivery models.

It is generally agreed that the only way to meet the increasing needs brought about by the demographic trends, while at the same time not bankrupting national treasuries, is to provide more care and services in the home [6]. As more care and services are being delivered in the home, several issues have emerged that raise serious concerns. In the first place, the care being delivered had steadily become more extensive. Whereas a decade ago rehabilitation after a serious illness or accident would have been undertaken in a specialized facility; presently many of these services are being provided in the home on an outpatient basis. But rehabilitation is just one of an escalating number of care services being provided in the home: nutritional counseling; wound care; psychological therapy; and medication adherence, to name several of the major ones. Additionally, the range of products and non-care services supplied to individuals in their own homes has increased significantly: oxygen; specialized beds; monitoring; meals; housekeeping; shopping; companion services. As the care and services have multiplied, so have the number of people providing the services. These companies/agencies are, of course, in addition to any services provided by informal carers. Thus, the need for a means of recording and tracking the care and services provided in the home are essentially the same as for institutions: increased reliability; better coordination; appropriate level of care; and cost savings.

As more care and services are delivered by more people representing different companies and agencies, just keeping track of who is providing what becomes increasingly difficult, especially if the individual receiving the care lives alone in her home and is experiencing cognitive decline or other impairments. Scheduling of visits and deliveries, ensuring the correct product or service, avoiding duplication all become difficult if records are scattered among various agencies, companies and individuals and are rarely, if ever, shared. It is also extremely difficult to evaluate if the care and services are having the desired impact on the individual if there is no systematic way to track the outcomes of the care and services. The lack of systematic and comprehensive records also makes it difficult for other care providers to make informed care decisions, since the reliance on the patient to remember specifics about the care and services in the home has proven to be suspect at best. In addition, if ehealth records of care and services in the home do not exist, it is obvious that they cannot be linked with the records that have been created in the hospital and the physician practice. Finally, even though delivering care and services in the home is more economical than in institutions, it still costs money and someone has to pay for it. As a result, from the point of view of the client receiving the care and services, as well as the insurance company and the government, there is a discernible need to track the care and services to ensure that what is paid for is provided and that everyone was paid appropriately.

The problem is that there has been a general reluctance on the part of many care organizations to adopt such systems. Research on various ehealth technologies indicate that there are many explanations for this reluctance, among the most important being: unwillingness of care providers to change how they do their work; fear of a loss of professional autonomy on the part of care providers; insufficient training; inadequate investment in IT infrastructure; and a lack of a supportive culture within the care organizations [7][8][9][10]. The remainder of this paper reports on a series of problems encountered when implementing a particular ehealth data records system and uses ideas from the field of change management to offer an explanation for the system's lack of acceptance.

II. DESIGN PHILOSOPHY

The eTELEMED paper reported on the development of a wireless ehealth data records system: the Home Care Informatics System (HCIS) that attempted to fulfill the need for a means of recording and sharing details on the ever increasing care and services delivered to elderly individuals in their own residences. The system was developed and tested over an eight year period in a total of seven care organizations in three countries. The article's main focus was on the lack of acceptance of the HCIS on the part of the care providers in all seven locations, even though these very same carers had played a major role in the design of the system. Several possible reasons for the lack of acceptance were presented and, although they were consistent with the findings overall, the reasons were fairly unconvincing [1]. So it was not surprising that someone listening to the paper would suggest a different explanation for the lack of acceptance of the HCIS, specifically one rooted in the theory of change management.

However, before reinterpreting the lack of acceptance of the HCIS based upon the theory of change management, some background information is required as to the approach taken to its design and implementation. It was decided from the very beginning that the design of the HCIS would be driven by the end-users—the carers who would actually use the system to record and share information, e.g., visiting nurses, geriatric social workers, care managers. This decision was based upon previous experience gained from the development of another innovative ehealth project [11]. Even though seven patents were issued, a start-up company invested heavily in its commercialization and the company and patents were eventually sold to General Electric, acceptance of the product in the market-place was less than anticipated. One explanation for this lack of success in the market-place was that almost all design decisions were made by management, software developers and marketing personnel with little, if any, input from the people who would be using the system in the delivery of care. Thus, there was little "buy-in" on the part of the end-users and a general reluctance on the part of these care providers to make changes in their actions in order to incorporate the system into their normal care delivery model. This was the case even though the upper administrators at the care organizations were, for the most part, enthusiastic champions of the technology. The problem was that because the decision to use the system was driven by these administrators without any input from the people who actually delivered the care, this high-level enthusiasm was never duplicated among the end-users.

Based upon this experience, it was decided that in the development of the Home Care Informatics System as much control as possible over the design of the system would be ceded to those individuals who were actually going to be using the system to aid in care delivery. Not only did this approach appear to make sense because of the previous experience, but from the very beginning, and throughout the design process, the care providers at all seven care organizations were anything but shy in making suggestions about both the design of the system and how it should be used. In fact, as will be illustrated in the next section, it could be argued that the final iteration was so unlike the one originally conceived that it was actually a different product. Whether this was the case or not, the final design certainly reflected the input of the end-users much more than the developers.

In the next section, the actual design process is described, with emphasis placed on the role played by the care providers; in section four the reasons presented in the previous paper for the lack of acceptance on the part of the carers are briefly presented; in section five the reasons for the lack of acceptance are analyzed based upon the tenets of change management; in section six the two sets of explanations are compared; and in the last section future implications for the development and implementation of electronic records systems, as well as other innovative ehealth technologies, are explored.

III. THREE STAGES OF DEVELOPMENT

As stated previously, the development of the HCIS spanned an eight year period, involved seven care organizations and took place in three countries—the United States, the United Kingdom and the Netherlands. The first iteration of the HCIS was actually a research tool designed to work in conjunction with a behavioral monitoring system. This prototype was designed to systematically record the alerts generated by the monitoring system, as well as the care delivered based on the alerts and there was no thought at this stage of developing an electronic health records system. It was the reaction of the end-users, in this case geriatric social workers that began to shift the research tool to an ehealth application.

A. Stage 1—2006-2007

This process took place during a pilot study at Selfhelp Community Services, Inc. in Queens, New York and involved eleven geriatric social workers who provided care management services to over 200 residents [12][13][14]. Twenty-seven of these clients agreed to have the system installed for a six month period and to have the social workers use the resultant data in care management decisions. The problem was that there was no way to systematically collect information on the care actions that they took in response to an alert. The instrument created was labeled the **TAO**: **Trigger**, the system's alert; **Action**, the care action taken by the social worker in response to the alert; and **Outcome**, the health or care outcome brought about by the care action. A brief example illustrates the initial design of the TAO:

> **Trigger:** The system sends an alert to the geriatric social worker indicating an increase in overnight toileting for a particular client;
> **Action:** The social worker phones the client to inquire about the client's behavior;
> **Outcome:** Finding out that the client was frequently in the bathroom because of stomach flu, the social worker contacts the client's physician to obtain a prescription for medication.

Initially, the social workers filled out a paper form with the relevant information, which was then entered into a computer data base in order to allow analysis. This worked well for about two weeks, but at the first care review meeting several social workers complained that filling out the paper version of the TAO was time-consuming. They suggested that, since they were on their desk-top computers throughout the day, that it would be easier for them to enter the information directly into the spreadsheet themselves. In response to these suggestions, a computerized web-based version of the TAO was created and this new version became the first design change driven by its users.

This new Web-TAO form took about five minutes to fill out, could be easily shared with others and, most importantly, could be updated as more actions and outcomes occurred. In the short run, this last feature proved beneficial for the social workers as they could quickly and almost effortlessly update the Web-TAO records for individual clients. In the long run, the need to have an update capability proved essential in the development of the HCIS. This is because, although the alert is a discrete event, care actions and health outcomes are not discrete, but instead roll out over time. The previous example of the TAO narrative has all three elements as discrete events—one Trigger, one Action, one Outcome—and this example corresponds to approximately 40% of the TAOs. However, a majority of the TAOs corresponded more to the following example:

> **Trigger:** The system sends an alert to the geriatric social worker indicating an increase in overnight toileting for a particular client;
> **Action:** The social worker phones the client to inquire about the client's behavior;
> **Outcome:** Finding out that the client was frequently in the bathroom because of a stomach flu, the social worker contacts the client's physician to obtain a prescription for medication;
> **Second Action:** The social worker phones the client's daughter to report that her mother has the flu;
> **Third Action:** Daughter visits her mother the next day finding out that her mother is no better**;**
> **Fourth Action:** Daughter phones social worker reporting on mother's condition;
> **Fifth Action:** Social worker visits client, determines that she is dehydrated, phones physician;
> **Sixth Action, Second Outcome:** Physician decides to have client admitted to hospital;
> **Seventh Action, Third Outcome:** Client is discharged after two days in hospital.

All of the above actions and outcomes were the result of the single alert and could now be entered into the Web-TAO as the events rolled out in real time. As a record of care provided and outcomes generated, the Web-TAO proved extremely helpful to the geriatric social workers as they could more systematically track the progression of care and outcomes. However, the realization of how multiple care actions and outcomes could be gathered together in a single record proved invaluable for the future development of the informatics system that eventually became the HCIS.

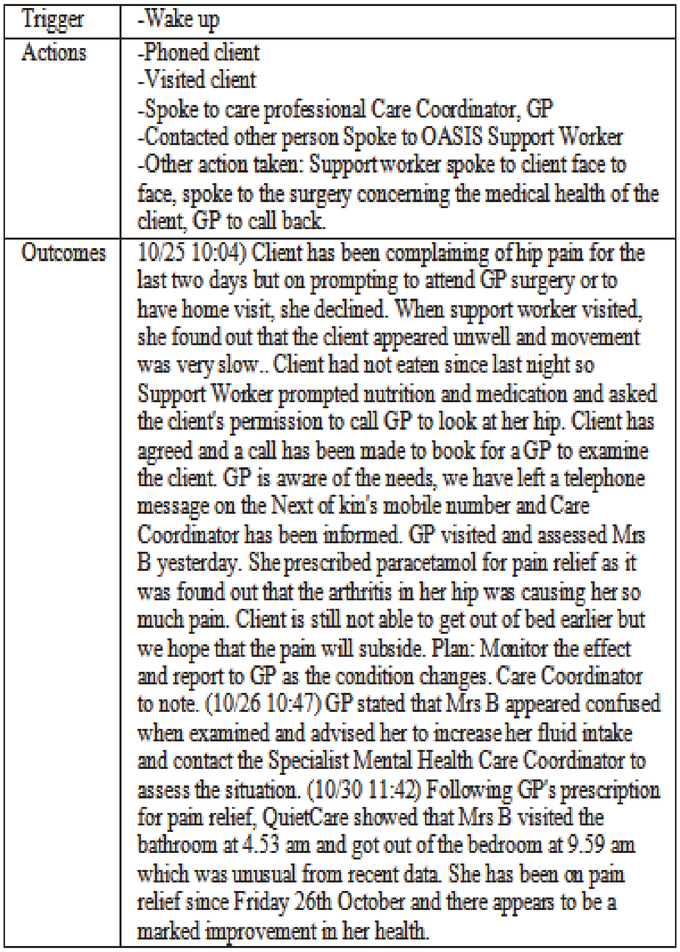
Once this alteration was made, the carers had other suggestions: add auto-populated fields; use check-boxes whenever possible; allow for easier follow-up entries; and allow access to individual records by other social workers and supervisors. At the first care review meeting, after these changes were made, two issues that would drive much of the development of the TAO surfaced. Since the objective for these meetings was to review what had happened to each of the clients over the previous month in order to assess how the monitoring system had impacted the delivery of care, it was not surprising that the TAOs were the focus of the discussions, but it was surprising how the social workers utilized the TAOs. They placed the TAOs for each of the clients together and then worked their way chronologically through the TAOs. By their actions, the social workers were constructing an on-going record for each of the clients by putting TAOs for the particular client together into a single "pile". This "piling up" was the first care record and would drive much of the future development of the ehealth system.

The second issue raised by the geriatric social workers concerned the ability of the Web-TAO in the evaluation of performance. For the supervisors, the Web-TAO provided an objective basis on which to evaluate the work performed by the social workers; for the social workers, the Web-TAO allowed supervisors to question their actions and professional conduct using information that had not been available previously. These issues were not resolved before the study ended, but, as discussed subsequently, it remained a vexing problem for the future development of the ehealth system.

B. Stage 2—2007-2008

As the Selfhelp pilot was ending, a pilot study in London was getting underway. Unlike the Selfhelp study in which all clients lived independently and had their care managed by a single care organization, the London study involved several residential types and more than one care organization. All residents lived in Southwark, an area of Central London south of the Thames, and were provided services from one of three care organizations—Southwark Falls, Oasis and Hyde Housing—all of which operated under the broad umbrella of the Southwark Local Authority. Thus, the work undertaken by "carers" in these organizations was much more coordinated than would be found in the independent organizations in the United States. However, even though these organizations were "independent" and served distinct populations, for this discussion it makes sense to view them as a single entity, the Southwark Study, and to aggregate their 97 clients.

Based on the development work undertaken at Selfhelp, the Southwark Study began with a fully operational Web-TAO that had the ability to easily update a report as care actions and outcomes rolled out over time. Within the first six weeks of the study, it became apparent from the analysis of the material being entered into the Web-TAO that the carers were using the system much differently than the social workers at Selfhelp. This was primarily due to the fact that the culture at Southwark was extremely collaborative and, although particular carers had primary responsibility for specific clients, all carers engaged with all clients in some fashion, and thus, the Web-TAO was conceived as a tool to allow for easier sharing of information among all carers rather than just a record of responses to triggering alerts. Therefore, the ability for all members of the care team to not only view the information, but to contribute to the information stream became paramount. The cultural imperative to share and contribute to the information of clients resulted in a modification that allowed for much longer narratives to be entered into the system which, as a result, took on the appearance of "blogs" in which numerous carers listed their actions and the subsequent outcomes for particular clients. Fig. 1 is an example of a typical "blog" for a single client.



Trigger	-Wake up
Actions	-Phoned client -Visited client -Spoke to care professional Care Coordinator, GP -Contacted other person Spoke to OASIS Support Worker -Other action taken: Support worker spoke to client face to face, spoke to the surgery concerning the medical health of the client, GP to call back.
Outcomes	10/25 10:04) Client has been complaining of hip pain for the last two days but on prompting to attend GP surgery or to have home visit, she declined. When support worker visited, she found out that the client appeared unwell and movement was very slow.. Client had not eaten since last night so Support Worker prompted nutrition and medication and asked the client's permission to call GP to look at her hip. Client has agreed and a call has been made to book for a GP to examine the client. GP is aware of the needs, we have left a telephone message on the Next of kin's mobile number and Care Coordinator has been informed. GP visited and assessed Mrs B yesterday. She prescribed paracetamol for pain relief as it was found out that the arthritis in her hip was causing her so much pain. Client is still not able to get out of bed earlier but we hope that the pain will subside. Plan: Monitor the effect and report to GP as the condition changes. Care Coordinator to note. (10/26 10:47) GP stated that Mrs B appeared confused when examined and advised her to increase her fluid intake and contact the Specialist Mental Health Care Coordinator to assess the situation. (10/30 11:42) Following GP's prescription for pain relief, QuietCare showed that Mrs B visited the bathroom at 4.53 am and got out of the bedroom at 9.59 am which was unusual from recent data. She has been on pain relief since Friday 26th October and there appears to be a marked improvement in her health.

Figure. 1. Web-TAO blog narrative

On the surface, this change appeared to be trivial, but in actuality it altered much of the design of the structure of the Web-TAO going forward. The Web-TAO had already mutated from a research tool to a care provision tool that tracked responses to the system's alerts, and now it had transformed again from a limited record of what transpired when an alert occurred, to a more comprehensive ehealth record of all care being delivered to a specific client over time. Fig. 1 not only shows the comprehensive nature of the information recorded, but also illustrates how many carers became involved in contributing care for this client.

The members of the newly formed Smart Team had other suggestions for the Web-TAO. One was to be able to send the "blog" to a client's physician prior to an appointment in order for the physician to have all relevant care information. This required the creation of a new security function that limited who could send and what could be sent to individuals outside the Southwark Smart Team. A second suggestion was to allow the "blogs" to be sorted by alert, particular carer, type of care actions and date of entry. Although technically not a complex undertaking, the challenge was to understand the uses to be made of such a sorting feature, before creating it. This change took time and the requested feature only became fully operational near the end of the study.

C. *Stage 3—2007-2012*

Work in the Netherlands began in late 2007 as part of a demonstration project to evaluate the role of behavioral monitoring in the delivery of care in both a residential and institutional setting [15]. During the first stage (2007-2008) of the project the behavioral monitoring system was installed in the residences of 12 individuals living independently and 13 individuals living within a sheltered housing facility, while in the second stage (2008-2012) the system was installed in the residences of an additional 230 individuals living independently throughout the largely rural Limburg Region served by two care organizations. Similarly to how the three London organizations were combined, it makes sense to view these two organizations, as well as the demonstration project and larger study, as a single entity and to aggregate the 255 clients into a single Dutch Study.

Since the demonstration project in the Netherlands began as the London Study was winding down, it was possible to provide the Dutch with an enhanced Web-TAO which had the ability to produce "blogs", which we renamed the "Client's Journal". Of course, the content of the Web-TAO, e.g., check-boxes, auto-populated fields, instructions, had to be translated into Dutch. The care delivery model at the two care organizations—Proteion and Zorgroep—required that their care workers spend a considerable amount of each day traveling to and from clients' residences. Thus, they spent little time at the two organizations' administrative headquarters, limiting their ability to both access the Web-TAO and to enter information on computers. This problem was solved by developing the capability for the Web-TAO, renamed the Home Care Informatics System (HCIS), to be accessed on any smart mobile device. This change in the structure of the HCIS to a wireless mobile service raised several design challenges. First, everything had to be reformatted so that it could fit the small screen of the mobile devices. This led to an even greater reliance on check-boxes and auto-populated features and to the development of more efficient scrolling features. Second, there was the challenge of making the HCIS display properly on the different smart devices used by the care workers.

Working directly with the carers during the demonstration project allowed for a series of other suggestions to be incorporated into the HCIS: 1) the Client's Journal feature allowed entries by any authorized personnel; 2) the Journal could be sorted by alert, date, care worker, type of care delivered and outcome; 3) there was a new feature that allowed additions to a previous entry, but not the elimination of the original entry; 4) a series of pop-up prompts helped the user navigate through functions and avoid common errors; 5) additional security features were developed to ensure that only authorized individuals could access and contribute to a client's record; and 6) a read-only feature was added. Even with these modifications, two issues remained unresolved. The first issue concerned how the HCIS was used during care review meetings at which time the care delivered to specific clients was discussed and decisions on future care made. These meetings included both individuals who had knowledge of and access to the HCIS and others who had neither. Since the client reviews were more thorough when everyone at the meeting had access to the information stored in the HCIS record, questions arose as to who should have access, how should they obtain access and who was in charge of making access happen? Although this issue does not directly concern the technical development of the HCIS, it certainly impacts the implementation of the HCIS and its long term use. The second issue concerned whether the information stored in the HCIS could be used by supervisors and administrators in the evaluation of work performance. On the surface, the concern expressed by the care workers in the Netherlands was similar to those raised by the social workers at Selfhelp. It was believed that these concerns could be fairly easily resolved by discussions of interested parties. This was not the case, and this issue remained unresolved at the end of the pilot.

D. *Summary of Changes*

Below is a summary of the changes made to the HCIS in response to the expressed needs of the people using it. A review of these changes brings into focus how much the TAO/HCIS changed during the six years studies in response to the wishes of the users.

Selfhelp

1. The TAO was put on the web;
2. A feature that allowed the sharing of TAOs was created;
3. Check-boxes were added;
4. Auto-populated fields were added;
5. A feature that allowed follow-up entries was developed.

Southwark

1. Changes made to conform to British English;
2. Enhanced sharing capabilities were developed to allow multiple team members to enter data;
3. Security features added to allow sharing of data beyond the Smart Team;
4. A blog structure was created that allowed data to be entered by multiple carers;
5. An added feature that allowed the sorting of the blogs by alert, carer, care action taken, health outcome and date.

The Netherlands

1. It was translated into Dutch;
2. The blogs became the Clients' Journals;
3. The system was made to be operational on any mobile device;
4. A feature that allowed additional carers to enter data was developed;
5. More auto-populated fields and check-boxes were added;
6. A feature that allowed entries to be corrected without erasing the original was developed;
7. Additional search features were added to the system;
8. A read-only feature was created.

The above summaries support the argument that the final HCIS was actually a different product from the one that was created as a research tool for the pilot study at Selfhelp. Given that the development of the electronic health records system spanned eight years and was used by over one hundred care providers at seven different care organizations, it should not be that surprising that the final product was significantly different from the original. However, what is surprising is that all the significant changes brought about over this period were made at the request of the end-users. Possibly even more surprising is that almost all of the suggestions made by the developers for the "improvement" of the system were rejected by the end-users. Some of these suggestions concerned the way material was displayed on the smart phones, i.e., the number and order of check-boxes, while others were more fundamental, i.e., an automatic notification when a client was discharged from the hospital. Following the design policy outlined previously, all changes suggested by the developers were made operational in order to be tested in the actual provision of care. After one month of use, the end-users were surveyed in order to assess the usefulness of the changes. If the results indicated that over 75% of the care providers rejected the change, it was made non-operational. For example, every one of the end-users found the automatic notification of a client being discharged from the hospital to be both unnecessary and inappropriate, thus, it was immediately made non-operational.

IV. LACK OF ACCEPTANCE

Even with all of these accommodations to meet the needs of the end-users, ultimately they stopped using the HCIS to record details of the care that they delivered even before the scheduled end date of the pilot studies. Most telling, the pattern of a gradual decline in the use of the HCIS leading to its abandonment, took place in all seven pilot study locations regardless of the care delivery model: care management; visiting nurse; coordinated intensive care management and residential setting: independent living; sheltered housing; high rise NORCS. Although frustrating, and initially perplexing, this result led to an analysis, and after the original paper was presented in Barcelona, a reanalysis of the reasons for why this lack of acceptance occurred. In order to assess the reasons for this lack of acceptance, questionnaires were administered to all eleven social workers at Selfhelp, while individual carers were interviewed in the Southwark and Dutch studies. In London, 70% of the carers were interviewed by phone and in the Netherlands approximately one-third of the carers were interviewed in person, while another third were interviewed by phone. Initial analysis of the findings derived from the questionnaires and interviews indicated that there were three main reasons for the lack of acceptance: 1) fear on the part of the carers that the information would be used to evaluate work performance; 2) the nature of the pilot study model and its impact on the carers' commitment; and 3) unwillingness of the carers to change their work routine.

A. *Evaluation of Performance*

Analysis of the carers' answers from the seven locations showed that the carers in the United States and the Netherlands were fearful that the information contained in the HCIS would be used by supervisors to evaluate their job performance. Two brief examples illustrate this ability of the information contained in the HCIS to evaluate the carers' performance. Each alert generated by the monitoring system is time stamped, as is every care action taken by a specific carer, and as a consequence, there is a concrete record of whether the carer responded to the alert and how long it took the carer to respond. In addition, the HCIS contains specific information on the type of response and the health outcome for each client over time, allowing supervisors to compare the work of different carers. It is this ability to compare the work of different carers which appeared to disturb the carers the most. And, it is indisputable that the HCIS allows this type of comparison to be made and for performance reviews to be based upon the information contained in the system. Not surprisingly, supervisors viewed this ability as an advantage because it documents performance, whereas, carers viewed it as an intrusion into their professional decision making.

B. *Problems with the Pilot Study Model*

The deficiencies of the pilot study model employed in the testing of the behavioral monitoring system have been detailed elsewhere [11], but some of these issues relate directly to the lack of acceptance of the HCIS. There appear to be four problems with the pilot study model. First, only a small number of carers were involved in the pilots at each of the organizations resulting in the studies being marginalized. At Selfhelp, only eleven of almost 200 social workers were involved in the study; while in London fewer than a dozen carers within the entire Southwark Local Authority had any role in the study and in the Netherlands, fewer than 5% of carers at the two organizations were involved in the study. Second, in no case was the HCIS used by the carer for all of her clients; instead it was always used for a small fraction of clients—on average no more than 20% and in only two cases over 50%—meaning that the carer was employing two different systems to record care. Third, information derived from the questionnaires and interviews showed that, because the carers knew when the pilot was to end, many carers put little effort into using the HCIS because they knew when it would go away. Finally, the HCIS was never part of "normal" care, but was always viewed as something that was just being "tested". As a result, the majority of carers responded logically by putting less and less effort into its use as the pilot progressed.

C. Unwillingness to Change Routine

Even though information from the questionnaires and interviews showed the importance of the previous two factors in the lack of acceptance of the HCIS by the carers, an even more important reason was their unwillingness to change their normal routine that did the most damage. There is no doubt that the HCIS required carers, at least initially, to do more work and undertake tasks which were unfamiliar. For example, in the Netherlands, carers, instead of just writing a couple of lines on a piece of paper kept in the client's residence, were expected to type in information on their smart phones before driving to their next appointment. They were also expected to update this information as additional care was delivered and even track and record health outcomes over time. These tasks were viewed as especially egregious since not all of their clients were in the pilot study and, therefore, they had to employ two different recording systems. Finally, it was difficult for the carers to see the value in this extra effort, because the benefits of better and more coordinated care were in the future, whereas the extra work had to be done every day.

D. Limited Generalizability

These three reasons appeared, prior to the Barcelona presentation, to explain the lack of acceptance of the HCIS in the care organizations, but there was still a serious unresolved issue: other than somewhat similar reasons for the lack of acceptance of another electronic health care records system in Germany [16], there were no other examples in which these particular reasons for the lack of acceptance of innovative health care technologies. This was disturbing enough, but when combined with the fact that the HCIS actually worked as envisioned, the records contained in it were readily shared, there was documentation that appropriate care based on the records was delivered and the system had been largely developed based upon input from the carers using the system, the three explanations just appeared insufficient to explain the consistent pattern of non-acceptance. And the pattern was eerily consistent. Within four months at each of the organizations the information the carers entered was increasingly uninformative and by the end of the pilots a majority of the carers at each of the seven locations had stopped using the HCIS altogether. There just had to be a better explanation for this lack of acceptance than that the pilot study model was limiting or that the carers were worried about their supervisors using the information contained in the HCIS to evaluate their work. As it turned out, there was; it just took the question about change management to elicit it.

V. CHANGE MANAGEMENT

An examination of the field of change management quickly provided an answer to the apparently simple question asked in Barcelona: the findings from the seven pilot studies were an example of the process of change management. The introduction of the HCIS required fundamental changes in the way that the seven organizations structured their business and care models. This did not take place with the result being a lack of acceptance on the part of the end-users which led to the non-adoption of the product. However, to fully understand this process, a reanalysis of the findings using the tenets of change management was necessary. This reanalysis not only brought into focus the inadequacy of the previous explanations, but, more importantly, highlighted a series of challenges facing the rapid and smooth introduction of new innovative technologies into existing health care systems.

A. Key Features of Change Management

This is not the forum for a detailed discussion of the field of change management, but several key elements of the approach must be briefly outlined before the reanalysis of the findings from the seven pilot studies can proceed. The main problem with providing such a summary is that change management is not a theory, but instead an approach or a process that is used in almost any type of business environment to manage almost any form of change, from the development of a new product, the introduction of a new technology, to the reorganization of a company's management team and everything in-between. There appear to be as many definitions as there are practitioners, consultants and gurus, selling, lecturing about and implementing change management. Any number of certificate programs are offered by any number of entities (companies, associations, universities) and an ever increasing number of books and journals devoted to specialized types of change management within the business community—IT, Human Resources, supply chain—which are easily available. Thus, change management can be almost anything making a single coherent definition difficult.

However, there are some common features upon which almost all practitioners agree. First, the field of change management can be traced to the 1962 publication of *Diffusion of Innovation* by Everett Rogers [17] in which he divided people into four categories: early adopters; early majority; late majority; and laggards to illustrate the way change flows through organizations. Rogers' work proved so influential that by the 1980's and 1990's the field was expanding exponentially as businesses and organizations faced the need to incorporate new technologies. It was during this period that a series of "principles" of change management were developed by different practitioners, usually consulting firms which offered to guide organizations through the process of change management, for a price. The number of principles, as well as the emphasis given different principles, varied, but, most of the lists stressed that successful change management is about people and thus, success came when the focus is placed on the human side of the equation, not the technological side.

Although difficult, given the large number of approaches available, it was necessary to select a single approach to guide the reanalysis of the lack of acceptance of the HCIS in the seven care organizations. The selection of this particular approach was based on the combination of the degree of recognition within the field and suitability to the reanalysis [18]. As in most of the approaches, the authors provide a list of principles, but equally important, they emphasize that long-term structural transformation is based upon four characteristics: scale; magnitude; duration; and strategic importance, without which change will not be successful. It was the insight gained from applying these characteristics, along with the ten principles the authors put forward, to the findings from the seven care organizations which allowed for a much more robust understanding of why the HCIS failed to be adopted.

B. The Characteristics

This and the next sub-section read as a litany of mistakes, mistakes that now appear obvious and avoidable, but at the time of the studies, were hidden by day-to-day challenges of modifying the HCIS, incorporating it into the existing care model and handling technological glitches. The first mistake concerns scale—the need for the change to impact all or most of the organization. As discussed in Section IV, the pilot study model was set up deliberately to restrict the HCIS to a small portion of the organization's care providers. This was the case in all seven of the pilot studies and was really the fundamental mistake made and repeated over and over again, since technological innovation that is limited to a small portion of the organization cannot be successful [14]. Therefore, it was not the pilot study model per se that was one of the reasons for the HCIS's lack of acceptance, but instead its use by only a small percentage of the care providers within the organizations that doomed it to failure.

Likewise, from the very first pilot study the issue of magnitude—a significant alteration in the status quo—was ignored. In many ways, the seven studies were set up to maintain, rather than alter the status quo. First, the small number of carers who were using the HCIS were isolated from their peers within the organization and little, if any, information, other than complaints, flowed from the carers in the pilots to carers who were not. Second, the pilot studies were viewed by top management all the way down to the end-users as tests of a new technology, not as a restructuring of the way people did their jobs. If anything, since the carers participating continued to provide care in the "normal" manner to clients who were not in the pilot studies, even their status quo was not truly altered.

The negative consequence of maintaining the status quo was compounded by the time limits set on the pilot studies because changes in long term transformations must last months if not years in order for the changes to be sustainable [14]. Everyone knew at each of the studies how long they would last. On day one, the carers who were employing the HCIS knew that on a certain date they would quit using it as the pilot study would be over. There were no plans to continue the use of the new system beyond the end date and thus, no understanding of the importance of duration in the success of incorporating a new technology into the organization.

In retrospect, the management of the seven care organizations was telegraphing a lack of strategic importance of the HCIS—the fourth characteristic—by the absence of commitment to the key characteristics of successful change. The scale of implementation was in all cases small; there was no plan to change the way that the care providers did their job and the duration was short with the endpoint always known. The question is why if the management of the care organizations was serious in its desire to introduce the electronic records system, did it not take steps that ensured its successful adoption?

C. The Ten Principles

The answer to this question is complex, but much insight into what went wrong can be gained by comparing the process undertaken in the pilot studies to the ten principles of change management outlined by Jones [18]. A detailed consideration of each of the ten principles in each of the seven pilot studies is beyond the scope of this paper. Therefore, in order to make the main points without the material being overwhelming and redundant, the seven pilot studies have been collapsed into one composite study. This collapsing is justified because, even though the location and care delivery model varied from one location to another, structurally the pilot studies were very similar: the same behavioral monitoring system; one of the several iterations of the HCIS; elderly at-risk clients; and the delivery of care in the clients' residences.

Principle 1—"Address the human side" is important because the change will involve people doing their jobs differently after the introduction of the new technology. This principle was completely ignored in the pilot studies because they were viewed as a test of a new technology without any consideration of how the use of this technology would impact people at all levels in the organization. Only when the issue of the material contained in the HCIS being used in the job evaluation of the carers was there any discussion of the change in the way people did their jobs and this was solved by deciding, both in the United States and the Netherlands, that the material would not be used and nothing would change.

*Principle 2—"*Get buy-in at the top" for the adoption of the new technology appears to have been followed in the pilot studies. Top management and even members of the Board of Directors were champions of the introduction of the new technology, but the problem came from a lack of follow-through. How top management viewed the pilots and what they wanted to gain professionally from the studies has been discussed previously [11] but briefly, the managers were more desirous of personal and professional gain than transforming the way care records could be used to provide improved care. This disconnect between the goals at the top and the work at the level of care provision, turned out to be one of the biggest hurdles to the effective use of the HCIS.

Principle 3—*"*Involve essential personnel" was ignored at all levels and there was lack of leadership during the pilots. No champions were identified and given leadership roles within the implementation. Several champions at the level of care provision emerged during the pilots, but they were not encouraged to play a leadership role and suggestions to compensate these champions were routinely rejected. Perhaps most devastating was that supervisors, who were responsible for assigning clients to particular carers and supervising the performance of the carers, played only marginal, if any, role in the roll out of the technology. Even when several supervisors tried to become involved in the pilot, their efforts were rejected and their suggestions ignored. The result was that these supervisors were the most negative of all employees toward the introduction of the technology.

Principle four—No "formal vision statement" was issued during any of the pilots. Instead of explaining why there was a need to adopt the new technology and spelling out in detail the corporate goals associated with its adoption, the managers left employees to figure out for themselves why they needed to change what they were doing and how the technology fit with the vision of the organization's future. The result was no common vision and no real reason for anyone to buy into the changes necessitated by the introduction of the technology, and certainly no *Principle five*—"feeling of ownership" over the process developed. No one accepted responsibility and, as a result, no one stepped in when things went wrong. Management blamed the carers for not taking the pilots seriously, carers blamed the managers for making them do more and different work without any justification of compensation, the IT department believed that they had not been sufficiently involved in the planning of the pilot and the supervisors just blamed everyone for the disruption in scheduling.

Principle six—"Communicate the message" was violated primarily because no one took ownership of the process. Management's only message was, "test this technology". It was pretty much left up to the end-users to figure out how to use the technology in care provision and it was their responsibility to fix any problems that emerged as the pilot study proceeded. There were no channels of communication created by which information could flow to upper management primarily because upper management did not want to know about any problems that could interfere with their claims of being at the cutting edge in the use of technology in care provision. If any message was sent, it was that no one was taking the pilot studies seriously.

Principle seven—"Assess the cultural landscape" was neglected because of the lack of seriousness conveyed by upper management. In a perverse way, the pilot studies actually assessed the culture and peoples' behavior at each level of the organization by documenting the overall lack of desire on the part of almost everyone in the organization to change how they did their jobs. People were happy doing what they were doing because they firmly believed that the existing care model worked, so why change. Since there was no clear message about the need to change from upper management, there was no reason for people to alter their behavior and change the culture of contented status quo. As a result, since there was no effort to assess the culture, there was no attempt during the pilot studies to follow *Principle eight*—"address the culture explicitly" in order to bring about the effective integration of the technology into the existing care model. Even when it was clear that carers were not using the HCIS, no one in management did anything about it. Instead of explicitly building a new culture that would have encouraged carers to make a greater effort to use the new technology, managers and supervisors allowed the existing culture to continue with the result that, over time, there was no incentive for anyone to change her/his behavior.

Principle nine—Given that upper management took no action when the carers stopped using the HCIS illustrates the degree to which individuals at all levels did not "Prepare for the unexpected". There were no contingency plans, no committees, no individual administrator or carer who was responsible to deal with the unexpected. Everything was ad hoc and problems were not addressed until someone—a carer, a client, a family member of a client—made a fuss. Then someone took an action. The problem was that it was arbitrary who that person was and the action taken, even if effective, was never institutionalized so that it could be used when a similar or different problem arose. As a result, it was the problems that became institutionalized and over time these problems were used as a justification for discontinuing the use of the HCIS.

Principle ten—"Speak to all individuals involved" was perhaps the most neglected of all the principles. Since no one wanted to admit that there were problems, no one spoke about these problems. The concept of having a well thought out system of rewards for carers who used the system was rejected, even though such an idea was continually suggested by the systems developers. Even when carers just stopped using the system, no one spoke to them to either encourage resumption or to determine why the individual had stopped using the system. The lack of concern reinforces the conclusion that there was a complete absence of a strategic plan for the incorporation of the HCIS into the care delivery model.

VI. DISCUSSION

The last of the pilot studies ended December 31, 2012 and currently the HCIS is not being used within any care organization. Thus, it is fair to conclude that the HCIS is a failure, even though it was used for over eight years to create and share information on the care of hundreds of at-risk older people. In the end there was a lack of acceptance on the part of the very end-users who designed the system. This is an irrefutable fact, but the reasons for the lack of acceptance are not so clear cut. Two different explanations have been offered for this result: one based on conclusions drawn exclusively from the evidence generated by questionnaires and interviews; and the second, although based on the same evidence, using the tenets of change management. Neither is wrong, per se; rather it is the difference in the ability to generalize the findings beyond these particular pilot studies that differentiates them. The first explanation is idiosyncratic and can only be compared with other studies using a pilot study model, while the second can be compared with any number of examples of how the process of change management can be used to understand the introduction of new technologies in a variety of industries.

It is clear that the seven pilot studies, to one degree or another violated each of the ten principles outlined in the previous section. It now appears to have been completely foolhardy to believe that at the end of the pilot study the HCIS would be adopted and incorporated into the existing care delivery model, simply because the HCIS required a new care delivery model to have been created. This new technology, if adopted, required a new way of organizing the delivery of care, necessitating a dramatic change in the way carers, supervisors and upper management did their jobs. In order to bring about such dramatic change, the leaders in the care organizations needed to develop a coherent strategic plan that addressed the challenges that this disruptive process put in front of them. In retrospect, the administrators at the organizations either needed to apply the tenets of change management themselves to this process or to have hired a consulting firm to direct the process. However, these options were never seriously considered simply because the pilots were viewed as “tests of a new technology”. The belief was that if the technology worked, then it would just be seamlessly incorporated into the care delivery model. There was no recognition that this incorporation either could change the way people did their jobs or that people would just stop using the technology.

As it turned out, the fact that the end-users played a major role in the design of the HCIS was of little consequence to the final outcome. This inclusion of the end-users was just a furthering of the belief that the pilots were a test of the technology. The belief was that if the carers designed the technology, they would be more likely to use the technology in their work. Thus, the carers in the various pilot studies were encouraged to design the system, but once the technology changed how they did their jobs and no inclusive strategic plan that explained the long term goal of the introduction was produced, they stopped using the system. The original idiosyncratic explanations for the lack of acceptance of the HCIS were not wrong, but instead they were symptoms of the much larger issues captured by applying the tenets of change management to the process. The carers’ worry about how the information contained in the HCIS could be used to evaluate their job performance was a real concern and the lack of response to these concerns illustrates that it was impossible for the pilot studies to have led to adoption of the HCIS: the complexity of the process was just underestimated by everyone involved.

VII. CONCLUSION

Several findings are apparent from the material presented above, some of which are specific to the pilot studies, while others are of a more general and important nature. Of the former, two are the most obvious: 1) it is possible to create an ehealth data system for home care and that such a system can be used effectively to coordinate care and services and contribute to the maintenance of independent living; and 2) the success of such a system is dependent on issues that do not concern design and functionality, but instead on its acceptance by the people employing the system. Even when much of the system’s design was driven by these users, there was a lack of acceptance on the part of these very same people. Three reasons were put forward as the main factors for this lack of acceptance: the potential use of information in the system for the evaluation of job performance; the pilot study model; and the unwillingness of the carers to alter their normal routine. However, these reasons were unsatisfactory because of their lack of generalizability. In place of these idiosyncratic reasons, an analysis based upon the tenets of change management was offered which led to a second set of outcomes which prove to be much more important to understanding, not only the lack of acceptance of the HCIS, but of more fundamental challenges facing the introduction of new technologies.

The most important finding from this analysis was that there is no such thing as a test of technology in the real world. Tests of technology take place in the laboratory where conditions can be controlled, not in the world in which people have to provide care on a daily basis to at-risk elderly. In the real world what is being tested is the organization’s willingness to change the way things are done so that the new technology will be used. The fact that the HCIS worked as designed and, thanks to the improvements made at the behest of the care providers, worked much better at the end of the eight years during which it was used, supports the view that tests of technology can only occur in the lab. It was not the technology that resulted in the lack of acceptance, but the fact that the carers did not want to change the way they did their jobs and there was no plan to alter the status quo. There is no reason to review the mistakes that were made from a change management perspective to conclude that there was no chance that the HCIS would be adopted while everyone involved believed that the only thing being tested was the technology.

At an even more general level, two additional conclusions can be derived from the findings. First, it can be argued that new ehealth technologies, such as the HCIS, will only become widely adopted when the traditional care models are unable to meet the needs of the burgeoning elderly population. Basically it comes down to the argument—if it’s not broken why change it. The slow pace of the adoption of electronic medical records in hospitals and physician practices in the United States, even with government mandates and financial inducements from insurance companies, supports this simplistic argument. There will be a point at which the demographics overwhelm the ability of the current care models to provide for the huge number of elderly individuals who will need an ever increasing amount of services in the home and it will only be at that point that the new technologies will be adopted.

Second, when this time comes, not all organizations will be able to make the adjustments necessary to effectively adopt the new technologies. The internal inertia at many organizations will be so great that changing the basic work routines will just not be possible and thus, the only way the necessary changes will occur is for new organizations to emerge. This has been the history of technological change; new companies that embrace new technologies emerge and leap frog over the companies that refuse to undergo the necessary transformations. To think that this same process will not occur in the field of health care, in general, and home health care, in particular, is naïve.

REFERENCES

[1] A. Glascock, "If they designed it, why don't they want it? The lack of acceptance of an ehealth data records system," Proceedings of eTELEMED 2014, L. Van Gemert-Pijnen, H. C. Ossebaard, Eds, 2014, pp. 116-122.

[2] B. Shilling, "The federal government has put billions into promoting electronic health record use: How is it going?," www.commonwealtfund.org, retrieved October, 2014.

[3] B. Kaplan and K. Harris-Salamone, "Health IT success and failure: recommendations for literature and an AMIA workshop," JAMIA, vol 16, no. 3, pp. 291-299, 2009.

[4] K. Ashish, C. DesRoches, E. Campbell, K. Doneian, S. Rao, and T. Ferris, "Use of electronic health records in U.S. hospitals," NEJM, vol. 360, pp. 1628-1638, 2009.

[5] D. Ludwick and J. Doucette, "Adopting electronic medical records in primary care: Lessons learned from health information systems implementation experience in seven countries," International Journal of Medical Informatics, vol. 78, pp. 22-31, 2009.

[6] National Association for Home Care & Hospice, "Basic statistics about home care updated 2010," http://www.nahc.org, retrieved October, 2014.

[7] P. Esmaeilzadeh, M. Sambasivan and N. Kumar, "The challenges and issues regarding e-health and health information technology trends in the healthcare sector," in E-business Technology and Strategy, M. Zaman, Y. Liang, S. Siddiqui, T. Wang , V. Liu and C. Lu, Eds, Berlin: Springer-Verlag, 2010, pp. 23-37.

[8] N. Zakaria, S. Affendi and N. Zakaria, "Managing ICT in healthcare organization: culture, challenges, and issues of technology adoption and implementation," in Handbook of Research on Advances in Health Informatics and Electronic Healthcare Applications: Global Adoption and Impact of Information Communication Technologies, Y. Dwivedi, K. Khoumbati, B. Lal and A. Srivastava, Eds., Hershey, PA: IGI Publishing, 2010, pp. 153-168.

[9] Robert Wood Johnson Foundation, "Health information technology in the United States: Progress and challenges ahead, 2014," http://www.rwjf.org/en/research-publications/find-rwjf-research/2014/08/health-information-technology-in-the-united-states.html, retrieved November, 2014.

[10] Altarum Institute, "Overcoming challenges to health IT adoption in small rural hospitals," http://www.healthit.gov/sites/default/files/pdf/OvercomingChallenges_in_SmallRuralHospitals.pdf, retrieved November, 2014.

[11] A. Glascock, "A conflicted view of telehomecare after a 20 year journey," Amsterdam: IOS Press, 2012.

[12] A. Glascock and D. Kutzik, "A care informatics approach to telehomecare applications," in The Handbook of Research on IT Management and Clinical Data Administration in Healthcare, A. Dwivedi, Ed., Hershey, PA: IGI Publishing, 2009, pp. 368-382.

[13] A. Glascock and D. Kutzik, "The impact of behavioral monitoring technology on the provision of health care in the home," JUCS, vol. 12, no. 1, pp. 59-79, 2006.

[14] D. Kutzik and A. Glascock, "An Evidentiary Report of QuietCare®: Selfhelp Community Services," unpublished.

[15] C. Willems, M. Spreeuwenberg, L. van der Heide, A. Glascock, D. Kutzik, L. de Witte, and J. Rietman, "Activity monitoring to support independent living in Dutch homecare support," in Everyday Technology for Independence and Care, G. Gelderblom, M. Soede, L. Adriaens, and K. Miesenberger, Eds., Amsterdam: IOS Press, 2011, pp. 145-151.

[16] M. Schapranow, "Personal communication," during the Fifth International Conference on eHealth, Telemedicine, and Social Medicine, Nice, France, February 2013.

[17] E. Rogers, "Diffusion of innovations," New York: Free Press, 2003.

[18] J. Jones, D. Aguirre, and M. Calderone, "10 principles of change management," Strategy + Business, Booz Allen Hamilton Inc., pp. 1-4, 2004.