Study on the requirements and options for RFID application in healthcare

Workshop Report

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Introduction

It has been suggested that the application of RFID technology in healthcare has great potential to improve patient safety, reduce medical errors, and overall contribute to the quality of care delivered to patients. In addition, the costs and efficiency of healthcare delivery may also benefit from RFID technology. It is expected that availability of the technology, both inside and outside healthcare, will grow quickly over the coming years (for example, one forecast predicts that the number of tags delivered in 2016 will be over 450 times the number delivered in 2006). A key question for policy makers is what actions should be taken, and what further research is necessary, to ensure the new technology will reach its full potential. It is possible that without taking timely and appropriate action, cost savings, improvements in patient safety and reductions in medical errors might not be realised.

At the same time, the application of RFID raises issues of privacy and security. For example, patients and staff members might be concerned about their privacy if they can be tracked by RFID. Furthermore, there are safety issues due to interference of RFID with other equipment. Also, when RFID is used as a means of identification, illegal copying of tags could pose a security threat. Key questions for policy (current and future) are: what are the interests that need to be protected (e.g. ensuring the privacy and security of patients and providers; improving the patient safety and quality of care, and reducing costs of healthcare, etc.); what kind of policy intervention would be useful/necessary; and what level of regulation is required?

In order to respond to these questions the project team organized the workshop, building on the results of a literature review and a Delphi survey, as well as a number of specific case studies, and using a number of scenarios in order to be able to explore future impacts and needs for policy action.

This report summarizes the discussions in the workshop, without giving a verbatim of the proceedings. Its seeks to extract the relevant policy lessons and recommendations for the future. As such the workshop and this report are important contributions to the overall objective of this project.

CHAPTER 1 Approach

By definition, policy and research options will have an ex ante effect. We are able to determine current use of RFID, in terms of technology solutions, benefits and costs. However, it is important today to consider the key uncertainties with regards to future developments in healthcare, and the possible role of RFID in healthcare, when looking at policy options and research needs.

For that purpose, we developed scenarios, with as their dimensions relevant uncertainties that we cannot influence directly, and against which we fleshed out stories of different possible futures.

1.1 Scenario dimensions

The uncertainties inform a choice of scenario dimensions, which in turn define the total 'scenario space'. While considering these and other uncertainties; the following dimensions relating to health care and (RFID) technology deployments were chosen and applied:

1. Nature of healthcare delivery: Focus of health care delivery on "total health management" vs. focus on health incident management. With "total health management" we mean continuous caring about the health and –in extreme- lifestyle of people through prevention, continuous monitoring and treatment whenever needed. A focus on health incidents reflects much more a hands off approach with no action until a health incident takes place;
2. Level of RFID deployment: Wide adoption of RFID (tags and readers) for a wide range of purposes (i.e. RFID becomes "normal" and is regularly used in daily life) vs. a narrow focus of RFID on logistical processes only;
3. Propensity to data sharing and use: linking of medical data from different environments (.e.g. social care, lifestyle, diet) vs. keeping all data separate, to be released at request only.

Based on these three dimensions we could develop in theory 8 different scenarios. However, for practical reasons we choose three, each differing from the other one in two places. The scenarios selected are listed in the table below:

Scenarios/ dimensions	SCENARIO 1 Private care society	SCENARIO 2 Central care society	SCENARIO 3 Incident care society
Total health focus	High	High	Low
General uptake RFID	High	Low	Low
Linking health data	Low	High	Low

Below we shortly sketch each scenario, and reflect the discussion on strengths, weaknesses, opportunities and threats as well as the recommendations for policy action that came up during the workshop. In the final chapter we draw some preliminary conclusions when comparing the outcomes of the sessions.

CHAPTER 2 The Incident Care Society Scenario

2.1 Description of the Scenario

Overall, this society is one where medical care is provided on a very basic level, with little emphasis on preventive care. In addition, advances have been made in better handling of emergencies, and incidents. It is here where RFID makes a difference as rapid identification of people in emergencies and accidents and their specific medical needs is available, and integrated in the incident handling activity supported by the "Medical Alert Chip" (MAC), which is standardised throughout Europe. The MAC only stores key medical information like allergies and heavy medicine use, to support the delivery of care in case of incidents. In this world, resources and incentive to innovate focus narrowly on specific health treatments and interventions such as elective surgery, accidents and emergency, short term ill-health. This leaves chronic conditions, long-term multifactoral health problems, and mental health care and other long term interventions under-funded. Care is provided in a largely low-tech environment. This has reinforced a division between the 'occasionally unwell' and the 'long-term sick' with older, poorer and non-employed people tending to be in the latter category. The European level has attempted to limit this trend but with little success and indeed European regulations intended to benefit excluded groups have been blamed for hampering improvements.

2.2 Strenghts

- **There is an increased expertise in the provision of healthcare services,** also growing at global level, allowing (global) exchange of best practices in treatments;
- Basic Pan-European healthcare coverage is supported by a **standardised information systems and a basic information infrastructure;**

- **Better-targeted use of (limited) resources,** as the economy is weak and all investments had to be explicitly justified;
- **Good emergency coverage,** useful and maybe a spearhead into overall service improvement, as there has been a process that led to agreement on standards of data exchange (see above);
- **Technology allows general flexibility of care**, and supports care where people need it, and can afford it. All it takes would be to make it affordable wherever it is needed!

2.3 Weaknesses

- **Widening social divide in terms of healthcare provision.** In the incident care society, additional care is only available to those with deep pockets;
- **Lack of a patient-centric view and little focus on improving quality of life and ambient-assisted living.** Demographic changes are likely to push democracy towards a better provision of healthcare, in particular for the elderly.
- **A limited and very linear idea of innovation**: The Incident Care Society takes a very linear approach to the future and does not seem to consider disruptive tech changes. Besides, it does not seem to offer room for new solutions that seek to make processes more cost-efficient and to provide clear benefits. There is no regulation that forces healthcare providers to assess and improve processes. Innovations are likely to take place outside EU. (-> THREATS)
- **Lack of overarching technological and operational standards:** complex global value chain of healthcare will require agreement on technological and operational standards.
- **Lack of appropriate overarching legislation**
- **Lack of general cost transparency** in the provision of healthcare services which leads to limited valorisation of EU strength (in particular EU research) in this field.
- **Poor use of healthcare data (data sets and standards) and no clear requirement for implants**

2.4 Opportunities

- **Opportunities to learn from other experiences** with additional care (which may well become wider and wider available against affordable prices, due to the distribution model (internet) and with (ensuring) access to data (e.g. RFID enables incident/emergency care information system (MAC) to access to ERP online)
- **To invest in innovative healthcare medicine** (e.g. electronic medicine) as there is a potential global market, and real steps to improvement of performance against low costs have to be taken;
- **To improve the overall quality of life** irrespectively of people's income and social status. It is already possible to improve the life of people with deep pockets, and this shows that it can be done, when public and private sector collaborate to push down costs and improve the service.

2.5 Threats

- **Security and privacy issues:** MAC and the underlying information system raises concerns about data on the chip. It will be important to continue to

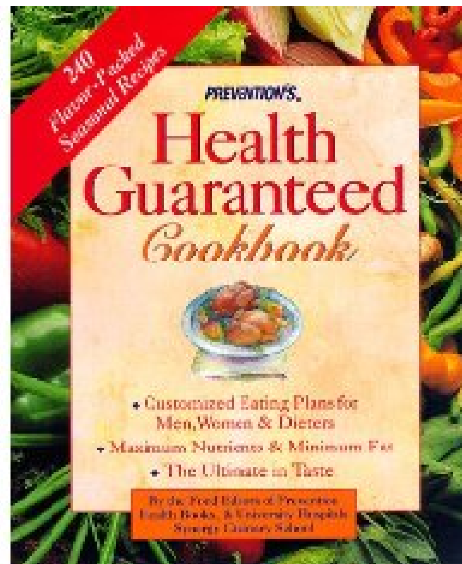
assure agreed levels of data protection. Minimization of data (as done with the MAC) is just one step in this;

- **Concerns about the side effect of implants:** An implanted MAC raises concerns about the side effect of implants, and these issues should be tackled with priority. In 2008, cases were known of implants that started "walking" through the body;
- **Innovation is likely to take place outside EU.** Increasing dependence on health care providers and developers in foreign countries, and mostly in the private sector i.e. with a focus on profit maximisation rather than public value.

2.6 Action points: looking back from the future, what could have been done today

1) **Informing Pubic Debate to ensure a common understanding and to establish a baseline. Key elements to inform a public debate:**
   a. *Common typology*
   b. *Classification of RFID applications (e.g. open/closed system, inbound/outbound care, etc)*
   c. *Understanding of potential health risks associated with RFID (and RFID implants)*
   d. *Understanding of magnetic fields and interference issues*
   e. *Learn from other industries (e.g. retail sector experience highlighted that it is important to give control to people and to allow them to deactivate the tag)*
2) **An open and transparent Public Debate that effectively communicates benefits, risks and the options to overcome risks.**
   a. *To be open to the public and to hear opinions of all stakeholders*
   b. *Clear indication of benefits and facts and to clear the debate from myths*
3) **Research Priorities**
   a. *Invest into research and establish a baseline where RFID in healthcare is now*
   b. *Research on organic technologies may avoid some of the technical difficulties to get us closer to better reading rates and higher reliability*
   c. *Research and investment into Ambient Assisted Technology*
4) **Ensure interoperability.** This is key to be able to truly stimulate innovation and to be able to benefit from it, as systems connect. Across vendors, and across versions.
5) **Review of legal framework for data protection** will follow and be fine-tuned ex post (e.g. patient centric development will require discussions on access to data)

CHAPTER 3 The Central Care Society Scenario



3.1 Description of the Scenario

The **central care society** is truly measuring and bringing together all medical data of its citizens, in order to be able to prevent health incidents by actively informing citizens about health risks. Also, in case of accidents as well as in cases where continuous health care assistance is needed, linking all data has proven to be effective and useful. The public value that is created through preventive care and life style support (lowering of healthcare costs, fitter people, less social exclusion etc) puts pressure on (and may even demand from) people to conform and follow up on healthcare recommendations. RFID enabled sensors will report compliance issues to the medic responsible for the health of that specific citizen. The cost of the system are covered by savings of the healthcare system as a whole. This cost saving potential provides an incentive to implement RFID. The coercive aspect to this has led to some resistance and refusal to participate in RFID-enable health care and has led to people being excluded from the main healthcare system and provided with a more basic service. Such people tend not to adopt a more ‘natural’ or ‘holistic’ approach to healthcare; instead they suffer poor levels of health status and health care. Particular anger has been expressed by those who object to data being collected in one sector (health) being made available to elsewhere (e.g. in food marketing, alcohol retail etc). Regulations exist at the European level but Member States have tended to give these very different interpretations through national regulation.

3.2 Strenghts

- **Information is used to encourage, nudge and oblige individuals to behave more healthily.** Different information strategies promote healthy living and reduce the costs of the health system Communication is only one of many strategies used to encourage a healthy living. Asking individuals and professionals to comply with certain obligations (without stretching it too far) in response to shared challenges is perceived as a positive sign in this society. In addition, government allows itself to use strategies that makes people adapt their behaviour, without requiring a conscious choice, which might also prove an important part of a strategy to stimulate healthy behaviour.
- **Governments aim to direct resources to greatest needs/preventive measures.** There is a greater control on costs as well as on the quality of the services. Furthermore, participants believe that in a Central Care Society, the higher control over the services and the reduction in the number of players (the governments takes most decisions) means that it is easier to manipulate and predict healthcare services.
- **Information sharing allows fewer errors, standardised delivery, and continuity of services.** Shared information offers significant benefits to patients, though also to health care professionals. A single multidisciplinary record with shared access offers patients a single pathway thereby ensuring continuity and efficiency of services.
- **Improved quality of healthcare and monitoring.** In the long-term various approaches to healthcare can change the structure of services and the impact on health:
    - With preventive healthcare supported by better monitoring, better information and advanced technology, people can start actively participating in their own health.
    - Preventive health accompanied by increasing self-management may change the way physicians provide their services. In fact, they could increasingly offer virtual services for standard consultation, and hence saving time to patients (e.g. travelling and waiting times). Physicians would concentrate on providing ‘physical services’ for critical diseases or specific health circumstances.
- **Centrally directed strategies allow both standardisation and personalised access.** Technology provides great opportunities, especially in the area of monitoring and prevention. By being able to self-capture data on daily activities, body indicators and vital signs, physicians can provide better and possibly more targeted personalised care.
- **Single purchasers can drive down costs.** In our Central Care Society the government is the only purchaser of health related services and technology. At the same time, the healthcare market is highly competitive, with a significant amount of companies fighting to sell goods or services to the only public health and healthcare body. This situation leads to a market where standardised technologies (set centrally) can be offered by a variety of providers at very competitive prices.
- **Technology empowers patients** by helping them to manage their health, supporting their decisions and actions, thus reducing the need to physically visit a doctor. With RFID and other healthcare technologies, people with certain risk factors, e.g. hypertension, or diabetes, are able to develop and manage their health more efficiently and effectively. Technology also allows people to have more access to their own health records and also share the healthcare data with other professionals to get a second opinion.
- **Continuous and comprehensive healthcare.** Participants identified ‘continuous’ and ‘comprehensive’ as two key words. Continuous health and social care in this Society means that the patient experience is seamless and

personalised. Patients have been offered a single pathway, which reduces medical errors, provides a more satisfactory service for the patient as well a reduction in duplication of processes (a one stop shop). Continuous health and social care is also perceived by the participants of this Society as a more efficient working stream (less resources for the same service), which saves time which physicians can alternatively devote to clinical services. Matching resources with identified needs allows a more efficient and effective Healthcare system. .

- **Trusted identification of patients** Among other, RFID is being used for the identification of patients, and matching them with their care environment and drugs. By using RFID to securely identify patients it becomes possible to "build in the system" a educuction of medical errors sometimes arising from mis-identification, or mismatching of medicin with allergies and/or combination with other medicins (e.g. because patients data is not carefully read).
- **Reducing counterfeit and improvement of the patenting system.** With RFID, medication providers can help secure the integrity of the drug supply chain by providing an accurate drug 'pedigree'. The 'drug pedigree' can offer a secure record documenting when and where the drug was manufactured and distributed and whether this was done under safe and secure conditions. As a result, RFID can serve as a trusted technology to reduce counterfeit. At the same time, if counterfeit is reduced, the patenting system can become stronger, thereby motivating companies to invest more in R&D.

3.3 Weaknesses

- **State may become too powerful.** A society where all the health and social services are offered by the public sector may have some important drawbacks in diversity of supply, efficiency and effectiveness of care delivery. Patients might see their range of health and social services choices reduced, and may be banned from choices government makes on the future strategic direction of health and social care. Suppliers may also have to adapt to a 'single-purchaser' market. Instead of being responding to the needs and requirements of the market, composed of many different clients and stakeholders, suppliers in this Society might be limited in the range of products and services they can offer.
- **Too few carrots, too many sticks.** The Central Care society is too focused on obligations and too little focused on offering incentives to people. A medicalised 'policing' society with high social pressure and wide prohibition gives rise to black markets and all the negative consequences associated to it.[1]
- **Administering access to data may become too complicated and raise ethical and practical problems**. Self-management of healthcare and access to data empowers patients to somehow decide on their own health. However, at the same time, a patient record that can be accessed by different stakeholders and health and social care professionals, might be complex to manage and administer. Different ethical and practical questions arise such as who the right person is to access which (part) of the patient's record. In fact, on the patient's record, data might need to be compartmentalised to limit and target the access to data based on a defined set of variables. On the other

[1] This world sometimes appears to be like the film 'Gattaca', in which society discriminates between people based on their genes, and physical and mental capacities. Only genetically 'perfect' creatures have the choice to carry out certain jobs like travelling to the stars].

hand, government ownership of patient's records is potentially dangerous as it could mean too much control by one single entity (the government).
- **Lack of human contact with providers.** Technology has been identified as interfering in social relations. By offering some of the traditional health and social services, patients in this Society would suffer from miscommunication and lack of human contact.
- **Over-dependency on technology and risk of security breaches and no back-up.** Significant failures still exist within the medication system, which makes developments towards a technology-dependent society rather troubling, especially if no security back-up systems and plans are developed.
- **What is 'normal' in medicine – over screening, re-defining and narrowing the 'normal' creating a cascade of interventions.** In this society, more and more individuals are defined by their health risk and face an over-medicalised lifestyle with preventive health interventions becoming the norm rather than the exception. RFID might be used either to ameliorate or worsen this.
- **Health becomes a neurotic and obsessive end in itself.** By focusing on preventive care and by implementing a sort of 'policing' society, health has become obsessive and neurotic, which might undermine the positive signs/effects of a preventive approach to prevention.

3.4 Opportunities

- **Identification of patients (with implants) can produce savings and benefits (accuracy, safety, data security, and time to answer).** True identification through different types of technologies such as implanted RFID or other technologies such as iris scans can produce significant benefits and savings. More specifically, true identification was identified as important to reduce medical errors. Although personal identification raises concerns about privacy, the issue is not directly about recording personalised and confidential data, but rather about the concerns of how information can be used and by whom.
- **RFID can support a convergence of technologies to address legal and social barriers.** If RFID can help manage (perceived) risks of the depersonalising of healthcare, the medicalising of normal life and the loss of personal privacy, there are considerable opportunities. We previously identified the issue of allocation of rights to access specific data. The private sector has an opportunity to widely mix existing technologies around personal identification and develop a convergence of technologies to overcome legal/ethical and social barriers. The RFID market already offers some versions of secure access control cards, smart cards, and other technology with a lot of processing and a lot of built-in security provides solutions. However, the costs of security are too high at this point in time.
- **RFID offers 'control' to individuals if used well (could be used to balance access and control).** RFID has often been identified as limiting people's control over data. However, access to data could be limited by creating decentralised storage systems instead of central systems and by offering the 'carrier' of RFID the option of controlling who and when can read RFID data.
- **RFID can be used in payment and reimbursement systems.** Participants identified RFID as an alternative that could be used to in payment and reimbursement systems, similar to the role and functions played mobile phones.

3.5 Threats

- **May fail to provide balanced access to data and lead to loss of individual control.** Complexity of administrating and managing access rights poses a difficult and challenging balance. Universal access and central storage might be cheaper and simpler to manage, but raises significant privacy and security issues. On the other extreme, targeted access and decentralised systems raises issues of defining who the owner of the data is, and consequently who will provide access to whom.
- **Emergence of new previously hidden costs and illnesses created by improved prevention.** As screening and preventive health interventions become increasingly normal, not only are false positives identified but underlying diseases are made more apparent requiring still further health interventions. Many people will be needlessly worrying about illnesses which will remain asymptomatic.
- **Monopolistic buyer may limit investment and innovation (and loss of competitiveness**). A society where the only provider and buyer of services is the public sector may limit innovation and competitiveness. By having to adapt and respond to the requirements of a single buyer, ICT and healthcare suppliers may not be encouraged to innovate. The lack of innovation may lead to lower profitability and hence to the survival of certain sectors.
- **Rise of the "health police" and a neurotic, health obsessed, unhappy population.** Our paternalistic and coercive Central Care Society characterised by compulsory prevention and monitoring, can lead to the rise of a neurotic, health obsessed and unhappy population. Hence the initial aim of both improving health and reducing costs through prevention might turn into the opposite aim: an unhealthier society that negatively impacts the health and social system. Furthermore, prevention is not always cost-effective, nor can it really be properly evaluated. The counterfactual to why people have been 'saved' from certain diseases is difficult to measure.

3.6 Action points: looking back from the future, what could have been done today

1. **Education/awareness**
    a. **Educate Society and explain them the opportunities and threats of RFID so they can make a choice**. Government, but also industry should work together to educate Society on the advantages and disadvantages of RFID. There is a need to develop communication strategies at different levels. Obviously, training and communication needs to be targeted adequately depending on the audience: e.g. developers, sellers, users, and carers of users of RFID. Education and awareness also means that people need to be involved in the process since the beginning.
    b. **Develop a brand or clear definitions to the different types of RFID**. RFID is a very broad field, with many different applications and purposes. However, RFID entails a wide range of products targeted for a variety of different sectors and purposes. Distinction should be made among them instead of trying to talk about RFID as a single homogeneous technology.
    c. **Education needs to address the perception that RFID deters privacy and security**. Technologies have been developed as to make RFID a secure technology. However, to ensure privacy, security and

confidentiality, education on data protection rights needs to be reinforced as well as education on how society can become involved.

d. **Involving civil society in decision making.** It is important to raise public awareness, but also to involve people in their own health to enable them to take their own decisions.

2. **Maintaining competitiveness**
   a. **Supporting SME in this field.** To maintain a society where technology development is not determined by a few large companies but by the interaction of ideas in a competitive market, government would need to put more efforts into maintaining SME. In a scenario where the government is the most important customer, the danger exists that small industries are 'eaten up' by large companies. Hence, the government should avoid dealing only with big clients. With big companies the danger is that the levels of innovation will be lower. In fact, innovation is very often generated by competitive markets where small and medium enterprises play a big role.
   b. **Culture of innovating processes (to also reduce costs).** Innovation is not only about technology but also about improving processes. It is only the combination of adequate technology and better processes which result in savings.
3. **Privacy/ choice**
   a. **Support patient's health and social care rights.** In this world, citizens may have lost control of what they want to do with their health. Therefore, governments need to assure that patient rights are handled through regulation. This could be achieved by implementing adequate legislation, as well as by implementing an adequate monitoring system. At the same time, a central organisation protecting people's rights accompanied by a well-functioning judicial system would empower patients.
   b. **Managing the unavoidable tension between collective benefits and individual freedoms.** RFID is associated by the public with lack of privacy, security and confidentiality and hence creates an unavoidable tension between the technology and democratic rules. In fact, people do not want to be treated the same way as 'merchandise' that can be tracked, traced and controlled. In other words, people feel that with RFID their freedom and privacy is disrupted. But despite many of the advantages of living in a society, there is also a price to pay and need to understand reade-offs.
   c. **Book 'nudge'.** Opt-out. One methodology to drag people into certain behaviour without coercing them into a certain direction is the so-called 'nudge option'. This technique is already widely being used by the private sector. With the technique, a default (healthy) option may be imposed on a citizen with the aim of 'nudging' him/her into the healthy option. Even if a citizen would be given the option to opt-out, evidence suggests that people tend not to opt out from a choice with which they are not particularly unhappy about. The 'nudge option' shifts certain level of decision-making from the patient/citizen to the policy maker.
4. **Technology standards**
   a. **Setting technology standards in general and for health in particular.** It may be that RFID healthcare can be managed quite differently from RFID in general and this should be considered. There has been a wide tendency to talk about standards for RFID more generally. However, each sector has its own issues and particularities that should be taken into account when setting standards.

CHAPTER 4 The Private Care Society Scenario

4.1 Description of the Scenario

The **private care society** is very well equipped with RFID to monitor and manage health issues, in a local context. Everybody has his or her RFID reader at hand, coupled with the mobile phone. RFID data are with the patient, who is in control. Whereas she or he cannot change critical health data without co-authorization of a medical professional, she or he can read the data and add “personal remarks”. Medical professionals need to have permission from the patient to read the data, which are protected by a patient-owned pin. However, in case of emergency access to the chip can be obtained using specific equipment that will require strict ex-post justification for its use. In this society, health is seen as something that needs to be protected by actively signaling health risks (prevention). For those recovering from health incidents and treatment RFID empowered equipment can help to keep track of progress and suggest specific action when required following a signal from (implanted) body sensors. This is a society with confidence in RFID and new technologies in general, with a strong European system of regulation effectively enforced at the national level. For those in regular work, with employer contributions to health insurance, it is a world of steady health improvement and growing security. However, few incentives exist to ensure that these benefits are spread to marginalized groups and more collective public health interventions aimed at benefiting the whole of society are often difficult to deliver. Few incentives exist to integrate health care

with related services (social care, diet and exercise support, healthy workplaces and so forth) although the technology to do so is available. A small but vocal minority is hostile to high technology solutions to what they see as ill-health created by a spiritual malaise.

4.2 Strenghts

- **Automation has lead to more efficient healthcare systems**: In the innovation and technology-intensive private care society, automation in the healthcare system has led to greater efficiency, leading to cost-savings and facilitating better quality (safer, more accurate, more reliable and more user-friendly) care. RFID adoption has enabled the faster and more reliable identification and tracking of patients and equipment/consumables alike, and logistics and inventory management is less laborious than in the past. RFID solutions are now favoured over barcode and Datamatrix solutions because of their added functionalities. The wide-scale adoption of RFIDs is also reducing their costs.
- **Competition between the major RFID solution providers still drives improvements in the quality of solutions:** Although the RFID solution provider landscape is consolidated (with 5 dominant players), competition for market shares between these players is strong. Coupled with a more demanding market and a society where patient choice is strong and heavily exercised, the competitive landscape is still driving the main RFID solution providers to continue innovating and delivering ever more user-friendly, reliable, accurate and safe RFID applications for healthcare. There is continuous optimisation of solutions in the sector, and diversification in the range of services a solution provider can offer.
- **Ambient assisted living is improving the management of elderly lives and enabling more comfortable lifestyles.** (This also applies to other social groups in need of such care – such as the physically handicapped): The adoption RFIDs and ICT for ambient assisted living is leading to the better management of elderly lifestyles, and the elderly feel safer and more secure as a result. In this world, they receive remote healthcare services which were not available in the past, and this reduces the time-demands on medical professionals (i.e. number of patient visits to hospitals), and allows for more convenient lifestyles for both elderly patients and their families. There is less need for elderly-care homes: in the past it was both difficult to secure a place in homes offering the best care, and to afford such care. Advances in the healthcare system are releasing more time for people (elderly and their families alike) to spend on other activities – be they work or pleasure related. In an aging Europe, ambient assisted living applications of RFIDs and ICT are facilitating significant cost-savings for economies.
- **The patient is control of his/her own personal data, and of how it can be used**

4.3 Weaknesses

- **A 'consolidated' RFID industry presents barriers to entry for new innovative enterprises.** The consolidation of the RFID industry into the 5 major integrated solution providers that dominate the EU landscape has created barriers to entry for new innovators – in particular SMEs. The same holds true for ICT suppliers. There are concerns that this will hinder innovation in the long-run. In addition, some ICT suppliers (which now hold large market shares) had compromised quality and safety of their services for

cost-differentiation competition strategies, making it particularly difficult for smaller companies which have tried to offer alternative technological solutions of higher quality, more user-friendly interfaces, and better privacy and security features to enter the market.

- **Poor interoperability between different RFID solution providers leads to lock-ins or high switching costs, and gaps in geographical coverage for patients.** Most RFID/IT solution providers use incompatible proprietary technologies. A lack of interoperability between the different solutions (applicable both within and between countries) creates challenges for: (i) healthcare service providers who may want to change which RFID and ICT systems they use over time, (ii) for patients wishing to switch healthcare providers, and (iii) for the "traveller market" in our increasingly mobile society, due to gaps in geographical coverage for specific RFID solutions. Coupled with the lack of a common EU-level EPR, the costs of transferring patient information to a new healthcare provider (who uses a different ICT/RFID system) are high and the process administratively cumbersome, leading to barriers to switching and perpetuating 'lock-ins'.
- **Poor interoperability has also impeded standardisation and the efforts to realise a ubiquitous information society.** There is little standardisation at the EU level, largely due to how the supplier markets evolved and the resulting interoperability challenges. The RFID and ICT adoption trend followed the logic of the market, and there is not a unified (standards) framework to deal with that[2]. There is a need for a set of common standards, that are credible and that people trust, and that allow for effective data sharing and management.
- **The social implications and consequences of an automated healthcare world have not been considered.** Although there are many articulated benefits from a more automated healthcare world, the trade-offs or potential negative consequences have not been considered. The social implications of a healthcare world where there is less human interaction (particularly in the context of ambient assisted living/telehealth) merit more exploration. Is the wide-spread adoption of ICTs leading to a more isolated and individualistic society? How will this influence social relationships? What are the risks of reduced human interaction in healthcare (as well as in other spheres of life)? Where and when is a non-virtual interaction necessary and why? How is the pervasiveness of technology in our lives affecting us 'mentally"?
- **Health gaps still follow income lines, and disparities persist.** Health gaps continue to follow income levels. The 'have – nots' do not have even remotely similar levels of access to the services enabled by new ICT/RFID technologies, are still marginalised and excluded form benefiting from the new modern healthcare solutions.

4.4 Opportunities

- **There is potential for the levels of RFID adoption to further increase.** The demands of healthcare service providers and the choices/preferences of patients for additional functionalities favours RFID (in healthcare) over other competing technologies (e.g. barcodes, DataMatrix). This creates potential for increased demand for RFID solutions in the future, as well as for further cost-reductions over time (due to economies of scale).

[2] *Key for adoption of RFIDs is how RFID tags communicate with other IT technologies in hospitals, and IT solutions within hospitals are still relatively immature*

- **Ambient assisted living is a very big market opportunity for RIFD adoption.** In an aging Europe, where more and more people are living alone, the size of the market for digital home technology and ambient assisted living is likely to increase considerably
- **There if potential to address the disadvantaged position of the poor in terms of access to quality healthcare, through the use of technology.** If, (and as) economies of scale are materialised and costs drop, there is potential for improving the provision of RFID-related healthcare services to marginalised people, and reducing the health and well-being gap between the rich and the poor (i.e. between different social classes)
- The sharing and linkage of data is low at present. But if the right guarantees for privacy, security and confidentiality are put in place to protect personal rights and interests, **there is potential for significant improvements in the linkage and exchange of complementary data, to further improve service provision and standards of care.** At present, this is a world where people have multiple partial identities which are not widely shared. If we move to a more linked-up world, the patient must still retain control over personal information, how it is used, and by whom.

4.5 Threats

- **Lack of systematic evaluative evidence on the value-added by RFIDs (over other identification technologies)** and this is a threat to the scale of long-term adoption, and hence the sustainability of the healthcare RFID for solution providers. Although the demand for added functionalities is driving increased RFID adoption, the value added of RFIDs over other technologies is still not clear or verified. (NOTE: What will happen if other technologies take over? How will service providers who have now adopted RFID technologies adapt?)
- **Spectrum-related capacity constraints might exist and impede the scale of adoption of RFID in the EU.** It is not clear whether there will be capacity available to support potentially higher-volume RFID usage in the EU. How the radio-spectrum and data traffic can best be managed needs to be considered.[I discuss this further under the actions section. Scarcity and competition for spectrum also influenced the consolidation trends, so that only the big players now can actually gain access to spectrum)
- **The misuse of patient data:** In this world, there is a danger of insurance companies misusing patient data (due to conflict of interest) and of privacy still being compromised. Since insurance companies own many care-providers, there is potential for them to access personal information and implement practices which would be against the interest of patients (e.g. excessively raising premiums for patients they feel are presenting excessive costs to the insurer; declining to cover costs, etc). Effectively enforced legislation has a big role to play in preventing such incidents, as well as effective, user-friendly technologies and services for data protection.
- From a competition and innovation policy perspective, if the trends of consolidation of ICT/RFID suppliers (which characterise our scenario) materialise, there are threats that this **impedes innovation by new players.**

4.6 Action points: looking back from the future, what could have been done today

1. **Spectrum access and management**

a. **Identify which of the existing RFID frequency bands can work best in a healthcare environment** (e.g. through primary research or evidence from existing RFID pilots) It is not clear whether there will be capacity available to support potentially higher-volume RFID usage in the EU. How the radio-spectrum and data traffic can best be managed needs to be considered. There is a need to identify which frequency bands can work best in a healthcare environment. It is likely that spectrum will be scarce. Today, there are 3 available standards (frequencies?) for RFID use in general (i.e. not only for healthcare). Some of these existing RFID standards may work better in a healthcare context, than others. There is a need to gather evidence about this (either through conducting primary research and/or examining evidence from existing pilots).
b. Examine whether existing spectra used across RFID applications are likely to **meet future demands /levels of traffic and be compatible in a healthcare context**. There is a need to also evaluate the need for a distinct frequency band for RFID in *healthcare applications* specifically. If there is not enough traffic in the future to require or justify this need, it may be more feasible and effective to use the spectra that are currently available for RFID in general (across applications). However, if the traffic is likely to be very high, or if existing bands are not well suited to a healthcare context, then it may be of value to proactively search for additional bands. At present, examining whether the ISM band is (or will soon become) too crowded is timely
c. Consider the **arrangements for accessing bands**. Another issue to consider is the arrangements regarding access to bands (e.g. would they be license free or not?)

2. **Interoperability issues**

a. **Establish policies and incentives which can push the development of technical middleware to deal with interoperability challenges**. A lack of interoperability between the solutions of different providers (within and between countries) creates challenges for: (i) healthcare providers who may want to change which RFID and ICT systems they use over time, (ii) for patients wishing to switch healthcare providers, and (iii) for the “traveller market” in our increasingly mobile society, due to gaps in geographical coverage for specific RFID solutions. Coupled with the lack of a common EU-level EPR, the costs of transferring patient information to a new healthcare provider (who uses a different ICT/RFID system) are high and the process administratively cumbersome, leading to barriers to switching and increasing ‘lock-ins’. To address these challenges, it may be worthwhile to first address the technicalities and establish policies and incentives which can support and push the development of technical *middleware* to help connect software components and applications, and thereby resolve the interoperability challenges.
b. **Governments should consider intelligent public procurement as a strategy for encouraging unified standards and interoperability**. Because interoperability is not just a technical challenge, but one associated with the competition environment, PPPs between governments and industry should be encouraged. Governments can insist on, but also provide incentives for universal standards, possibly via intelligent public procurement as a strategy for encouraging unified standards and interoperability, in areas of innovation.

c. Encourage **compatibility and uniform standards for how health-related data and information** are used in the EU, for the benefit of patients (e.g. names of medicines, understanding of conditions, treatment guidelines?) It is not just technical interoperability that is important, but also a level of uniformity and compatibility in the way health-related data and information are used in the EU. Policy makers could encourage informational compatibility between countries, for the benefit of patients. This can be applied to areas such as the naming of medicines and the descriptions and understandings of conditions.

d. **Focus on the patient safety aspects** of applications of tele-health and insist on "back-up" plans, if the "digital system" fails.

3. Privacy and security of personal information – data protection

a. Consider how an effective, accurate, reliable and **secure system for managing digital identities** can be created and maintained, and by whom it should be managed and regulated. In this world, people have multiple, partial digital identities. In a healthcare context, different parts of our healthcare provider chain have access to different aspects of our identities. There is a need for an effective, accurate, reliable and secure system to manage our multiple digital identities, both healthcare-related and those related to other sectors. Important points for policy action are to determine whether there should global or an EU digital identity system, and who will manage it? A public or private body? What types of agencies (local, national, regional or EU level) will be in charge of data management and personal information protection, and how will they be regulated?

b. **Identify levels of information a medical professional can access, under specific circumstances (minimal and maximum), and establish relevant legislation**. A limited essential common data set for EU EPR could be encouraged. It is important to identify the levels of information medical professionals can access under specific circumstances (both minimum and maximum thresholds), but to also consider the possibility of overriding the consented to levels of access, if essential in cases of emergency – with strong ex-post justification protocols and audits. In this it is important to consider how RFID can help in ensuring that only appropriate people have access to right information – this revolves around a broader question as to what extent we can look for technical solutions to problems which are today addressed by regulations.

c. **Ensure existing data protection legislation is effectively adhered to and enforced in healthcare applications** of ICT/RFID (as well as establish whether additional healthcare RFID specific legislative measures are needed to ensure safe and ethical practice). Clearly, mechanisms of ensuring that existing data protection legislation is effectively adhered to and enforced in healthcare applications of ICT/RFID are crucial, as well as to consider any additional data protection elements/legislation that need to be introduced specifically in relation to the deployment of RFID related information, and to ensure ethical and safe practice.

4. Awareness raising

a. **Engage in communication, awareness raising and training campaigns/programs** with the public to educate people on the use of ICT/RFIDs, the benefits and potential risks of RFID usage, and about how digital identities can best be managed. Awareness raising

about the ICT society and digital identity management should be embedded in national education systems. There is also a need to consider who (which local, regional, national and supranational organisations and stakeholders) are best equipped to deliver information and training in specific contexts, and who can most effectively filter and communicate information. In this world, awareness raising efforts need to be adjusted to the tipping point where RFID becomes a commodity

   b. **Introduce RFID Logos** about RFID attributes, to increase public acceptance, trust and awareness/access to reliable information. RFID Logos should be sending a consistent message to the public about various relevant RFID attributes, and these logos can play an important role in raising public acceptance and trust in RFIDs, and making the scale to which RFID is pervasive in society more transparent and visible to the public
   c. **Engage in stakeholder and social group inclusive ethical discussions and debate** about whether RFIDs should be mandatory or optional in healthcare, and under which circumstances (especially as it applies to chip implants). Some key issues in this regard revolve around whether some RFID applications in healthcare should be mandatory or optional (e.g. chip implants), and under which conditions. Are there different ethical considerations that need to be considered, and standards set for RFID use as a therapeutic versus identification device? And if so, by whom? Civil society needs to be consulted and included in these debates and in public communication efforts more generally speaking.

5. **The empowerment of patients**
   a. **Educate patients** about possibilities and necessities. There is a need for educating the public/patients about various new ICT solutions for healthcare (including RFIDs), and for more effective and transparent information management. Otherwise, patients are confused about the myriad of ICT and RFID applications available for use in healthcare (and in other aspects of their life), about how to use them, whether there are any potential side-effects (e.g. health risks) associated with the use of all the pervasive technologies, and if so - how these risks can be minimised. There is a need for better information (and better *communicated* information) about how patients/the public can best use the innovations to improve their lives.
   b. **Enable linkage of data stored on a local or remote server** (e.g. EPR database). While privacy and security standards are indispensible, enabling the linkage of data stored on a local (e.g. tag) or remote server (e.g. EPR database) within guarantees for respecting patient rights, could empower patients further. For example it could enable patients to see who is accessing their personal data, or to check when they did their last check-up of a sort (e.g. blood text, monitoring your own health).
   c. Create **sector specific laws** regarding how data can be managed in respect of empowering the patient.
   d. **Create avenues for user-driven innovation** to engage the patients and medical professionals in developing solutions that are better tailored to their needs by explicitly involving them and creating feedback loops.

CHAPTER 5 General observations and policy recommendations

5.1 General observations

Following the discussions on the specific scenarios participants were asked to voice their general observations and points of interest. Below are listed a number of such remarks, which were more or less generally endorsed by all experts present.

Policies and vision

- *Need for a vision*: It is noted that RFID is only a small part of a tech investment. Discussions should focus on functionalities and carry a particular vision for healthcare in the future.
- *Learning from others*: Health care development should benefit from experiences elsewhere, and technology is inevitable as a means to enable affordable healthcare for all. Yet there are also considerable risks that need to be addressed.
- *International comparison*: in Japan, the Cabinet is currently financing a major foresight study to picture Japan in 2025 (including health). It will help in setting priorities; allocate budgets and roles, and necessary tech investments. In the health domain, it particularly looks at person at personal care in home environments and its implications for healthcare and the pharma industry.

Technology issues

- *Substitution vs Complementarity*: RFID is only one ID technology out of many (barcodes, 2D barcodes, Datamatrix, etc). 2D barcodes or Datamatrix solutions are modern technologies and affordable printers have very recently been brought to the market. 2D barcodes and Datamatrix solutions allow to get a lot of data in a printed form. From an evolutionary perspective, 2D barcodes and Datamatrix solutions may be considered as a follow-up solution

to barcodes and passive RFID. Many problems can be solved with barcodes or other ID technologies and do not necessarily require RFID. NB: there are ways to integrate different technology inputs (like "uCode");

- *Integration*: RFID applications in healthcare in use today are often fragmented and not coherently embedded in existing infrastructures. To progress, it will require industry to provide a better understanding on how tags communicate with existing technologies and how to implement RFID in a barcode infrastructure.

Functionalities

- A *clearer distinction* needs to be made between RFID as a therapeutic device versus RFID as an identification device.
  - In therapeutic use, RFID is used in combination with sensor providing additional information (e.g. on vital signs).
  - As an identification device – as in any other sector - it can be used to identify a person (e.g. patient, staff) or assets (e.g. medical device).
- *Quality vs Cost*: When considering investing into RFID it should be to improve care and not to reduce costs. The real challenge lies in evaluating quality improvements, in particular when no (or insufficient) data exists on the status quo, and hence no benchmark to compare to.

Possible risks:

- *System Failure*: Any cost-benefit analysis on any RFID system should consider the requirements for and costs of the back-up system and try to evaluate the risk of system failure. In the health care sector, system failure can be mortal.

5.2 Robust recommendations for policy actions

When considering the action points as being raised in the scenario discussions, it becomes apparent that the following actions have been considered important in all scenarios, and are thus scenario independent:

5.2.1 Awareness raising and informing the public debate

Under all future scenarios the lack of information was identified as an issue that needed to be addressed, to remove the hype about RFID and undue negative perspectives. The purpose of this is ultimately to empower the patient and the allow policy makers, care providers and health insurers to make evidence based choices (investments, policies, reorganisation) to the real benefit of the quality and the decrease of the cost of care.

<u>The topics</u> that need addressing are:

- Explaining the facts, including the benefits and risks of RFID deployment in general and in Healthcare in particular; and options to overcome the risks. Among the *risks* that need to be communicated:
  - Interference
  - Privacy
  - Health effects

  Benefits:
  - Patient safety
  - Increased mobility of patients enabling out bound care
- Explaining the different kinds of RFID: active vs passive and open vs closed loop application; and what these differences entail
- Managing the tension between collective benefits and individual freedom, and making the trade offs transparent

<u>The instruments</u> that may be considered to achieve these objectives are:

- *Training*: specific training and embedding teaching (in the regular curriculum of the education system) on the use of ICT, the management and ways for processing of information and the value of privacy
- *Develop PPPs* to issue common messages
- *Inclusivity:* when developing a new ICT system in a care delivery environment – especially involving RFID and similar technologies providing functionalities like sensing, tracking, tracing and identification – it is important to involve all stakeholder at the start of the process to achieve acceptance and (possibly) ownership
- *Branding* of RFID (similar to Intel) as a positive technology, by getting across what the positive attributes of RFID are and how this relates to the specific kinds of RFID.
- *RFID logo*: increasing the uniformity and clarity of the message expressed

5.2.2 Interoperability and open standards

Interoperability was identified in all scenarios too, for a number of reasons:

- Expected impulse to *innovation* if systems are open to all and particularly SME soft ware providers to develop and offer new data based services. It would also allow patients to engage more actively in self-diagnostics and in better monitoring of their own data using a much greater variation of tools – possibly developed by themselves (user driven innovations)
- Possible solutions like uCode, in which the information regarding the objects is in on line databases, and the systems allows standardisation and interoperability between different systems to take place at middleware level. With such a solution, barcodes, RFID and other automatic identification methods may easily complement eachother;
- Lack of interoperability (and easy transfer of data) leads to *lock in* of patients by certain healthcare providers and insurers. In turn care providers could be locked in by technology suppliers that delivered closed systems.
- *Travellers and mobile citizens* want to move across borders and still be insured and have access to appropriate high quality care. This requires interoperability of the underlying systems, especially if electronic patient records (EPR) become a common feature in healthcare.

The instruments that may be considered to achieve these objectives are:

- Standards may be generic or more targeted to the healthcare domain. The specifics of the healthcare environment need to be taken into account when setting standards
- Push the development and deployment of technical middleware
- Intelligent public procurement for pushing the use of open standards
- PPPs

5.2.3 Privacy and security

Privacy is a reoccurring theme and needs to be specified further to be relevant for policy development.

- *Centrally storing patient dat*a on remote servers (EPR database), allowing the effective monitoring who accessed the data, when en for what purpose; also ensuring that the data set of a patient is complete and contains all relevant information..
- Creating an effective, accurate and reliable *eIDM system*, which caters for multiple identities and/or the use of different aspects of patients' identities along the healthcare value chain; determining if this should be at the national, sectoral, EU or even global level and who should manage and maintain it
- *Patient centric healthcare* provision will require the exchange and processing of personal patient data. To allow this to be done effectively in an

environment where the patient is vulnerable and the stakes are high - i.e. the propensity to give up privacy is very high too – a delicate balance needs to be struck between the responsible use of data and the protection of the data subject.
- *Patient safety aspects of system failures* need to be acknowledged and dealt with through effective back up plans

The instruments that may be considered to achieve these objectives are:
- *Review legal framework* for data protection may be considered. Creating sector specific laws to allow more flexibility and more control by the data subject; with better ex post enforcement, restitution and recovery mechanisms.
- *Effective monitoring mechanisms* for data abuse and instrument empowering the patients to claim indemnities in case of data breached
- Use *nudge options and opt outs*; allowing the patient a choice but suggesting one that is preferred over the other in line with some perceived and communicated private or collective benefit
- Develop *protocols* which catalogue the medical data which is accessible by who under which circumstances and back these up with appropriate legislation
- Using where possible technical solutions to overcome with current regulatory challenges, and enforcement/ implementation difficulties

5.2.4 Spectrum access and management

Spectrum management was raised in the context of the Private Care scenario. However in the plenary discussion it became evident that this is an issue which is relevant for all 3 futures, involving a number of different angles like avoiding interference, and dealing with scarcity of bandwidth. Some generally applicable suggestions for policy actions were:
- The need to identify the most appropriate frequency band (ISM?); assess what is still possible and what bottlenecks are occurring. Analyse capacity going forward in anticipation of much larger volumes of data being transmitted
- Consider a dedicated frequency band for critical/emergency services
- Assess spectrum access requirements (free, licences, etc)

The instruments that may be considered to achieve these objectives are:
- Use *large scale eIDM pilot STORK* and the eHealth pilot B to assess what the spectrum needs in healthcare are going to be

5.2.5 Research Priorities

- Health risks of RFID - radiation
- Reliability of RFID in critical healthcare delivery processes
- Interference issues
- Interoperability challenges in cross border applications
- Spectrum capacity requirements for supporting the future data transfer and processing needs in healthcare

5.3 Scenario dependent recommendations for policy actions

Other conclusions were more scenario dependent. For those it is important to monitor developments and see whether the circumstances that would benefit from such specific action emerge. In this respect some indicative ‘signposts’ for scenario specific action could be:
- Increase in private health care delivery, suggests that the private care scenario could become more in scope
- Developments in a technologically less developed health care setting will be more reflective of the Incident care scenario.

- Where government control is low and technology deployment is low it is more likely that a policy focus on one simple but robust enabling technology platform (like the MAC) is a wise option
- In data intensive environments where people are using their personal data in many ways, including commercially it is likely that a greater flexibility is required in applying data protection rules and that flexible self regulatory instruments may be more effective and old fashioned legislation. Thus a mix of the private care and central care discussions become more relevant.
- If general RFID uptake stays behind, it will be more useful to consider specific actions as discussed in the central care or incident care discussions.

5.4 Summary

In summary: it is important to ensure that patients are empowered, both in terms of access to medical health and for management of their medical data; that interoperability is key; and that privacy protection remains an important issue. For RFID to really take off more needs to be done to inform all users, to engage stakeholders and to create the enabling regulatory and technological environments including open standards, and a dedicated spectrum band.

Appendices

Appendix 1: Short scenario descriptions

The Private Care Society of 2020

Extract from “European Voice”, Volume 360(2)

26/03/2020. The Commission announced its first anti-merger inquiry into healthcare conglomerate EUROcare. EUROcare is the largest healthcare provider merger to date, linking the vertically integrated Medishpere group, with the German-Austrian Hippocatia Schutz Verrein GMBH. This has raised some eyebrows at the Commission. During the early years of the decade, healthcare providers, as well as health insurers, pharmaceutical companies and medical equipment suppliers began merging operations to create large conglomerates or fully integrated companies, to reduce costs and provide integrated services. Large health service providers typically used proprietary technology (including RFIDs), and this threatened the sustainability of many small innovative ICT firms, leading to a wave of consolidation into the 5 main healthcare ICT suppliers that now dominate Europe’s landscape. The Commission voiced concerns that innovation may become limited by these consolidation trends. It also identified considerable switching costs for patients wanting to change healthcare providers. The Commission’s position is somewhat at odds with the 2018 communication supporting healthcare market liberalisation (as part of the internal market policy). The Commission has also been largely supportive of the investments made by the Medisphere group and similar companies into developing new technologies and providing leading edge total care services to patients. It also played an instrumental role in the rebound of the EU RFID industry as global leaders in high-end health solutions. A spokes person of EUROcare commented that the group is “confident about the case, and trusts the Commission will show common sense in understanding what is good for patients and good for business.”

Responses to the financial crisis of 2008-2010 generally led a wealthier Europe, but disparities in rates of recovery and socioeconomic status persist between different regions and social classes. Europe’s responses to the crisis included pro-active public investment in S&T as an engine of recovery, and supportive incentives for innovative enterprises and ICT infrastructures. Signs of recovery gradually surfaced during the 2010-2012 period. After the first wave of large-scale redundancies and some bank and company failures, many innovative SME’s emerged and used the opportunity to pilot new business models. With the return to growth, government began divesting from banks and corporations it had ‘rescued’ (during 2012-2015 - the period we now refer to as “the great release”), and significant amounts of private investment money again became available to support new technologies, (including through FDI). (Government profited from some of its earlier shareholdings, and still continued providing supportive incentives for hi-tech enterprise). Many SMEs consolidated, creating a number of internationally competitive European technology companies.

In the RFID industry for health care specifically, consolidation of RFID solution suppliers was largely driven by the trend of consolidation of healthcare providers. By the middle of the decade, Europe had developed a strong reputation for high-value added RFID technology for health applications, supportive of patient safety and quality of care. RFID applications in other sectors (retail, logistics) remain dominated by the US, and increasingly China and India.

Over the past decade, technology has become more pervasive in diverse aspects of peoples lives, and public acceptance of technologies (including RFIDs) has grown substantially. Today, RFID chips are embedded in a number of every-day objects, and people ware tags for various purposes. In healthcare, RFID has become key to effective care provision, enables cheaper and more targeted treatment, and facilitates patient mobility. However, Europeans still consider privacy and security uncompromisable, and insist on retaining control over personal information.

It is widely agreed that the healthcare system has greatly benefited from investments in technologies, and especially in ICT and RFIDs. Private healthcare (in particular) has become more personalised, more attentive to the prevention of disease, and more enabling of outbound care. Private care providers are often vertically and horizontally integrated conglomerates (e.g. primary, secondary and tertiary care organisations, distinct healthcare supplier chain businesses). Competition between healthcare providers is strong, and patients have easy access to publically available performance information (audit data, rankings) on the quality of service of different individual practitioners and institutions. In fact, the patient today is has become more like a client in any other regular service industry.

The Incident Care Society

26 March 2020
This world is a world we could not have imagined to have developed a decade ago. The impact of the financial crisis has affected us all, and the European straight jacket of limited national debt in the EURO zone has really stopped governments from investing in any other areas than those of direct importance for support of economic development or for keeping up the welfare state (in terms of unemployment benefits and pensions). Emphasis has shifted to infrastructural provisions and education, and, unfortunately necessary, to employment stimulation programmes and retraining, as the workforce has grown older over time.

Overall, this society is one where medical care is provided on a very basic level, with little emphasis on preventive care. In addition, advances have been made in better handling of emergencies, and incidents. It is here where RFID makes a difference as rapid identification of people in emergencies and accidents and their specific medical needs is available, and integrated in the incident handling activity. It helps to keep emergency workers alert and informed. For this everybody has a "Medical Alert Chip" (MAC) and the information on it is standardised throughout Europe.

In this world, resources, and therefore the incentive to innovate, focus narrowly on specific health incidents such as accidents and emergency situations, and short term ill-health. From the global marketplace high tech top quality medical care is available, yet at high prices, and mostly facilitated by technologies not developed in Europe, and medical professionals that are local extensions of top expertise on a global level into which can be tapped through telemedicine means. Traditional care providers find themselves in very difficult economic circumstances, as their traditional cost models, based on old investments, make it impossible to compete with newcomers that offer private care solutions. It is not clear how this will be resolved, and think tanks are considering the best ways forward.

This leaves chronic conditions, long-term multi-factoral health problems, mental health care, preventive care and other long term interventions under-funded and provided in a largely low-tech environment. This has reinforced a division between the 'occasionally unwell' and the 'long-term sick' with older, poorer and non-employed people tending to be in the latter category.
At the European level attempts were made to limit this trend but, with the exception of the introduction of MACs, with little success and indeed European regulations intended to benefit excluded groups have been blamed for hampering improvements to the healthcare system, as additional care and advanced care is hardly affordable for those who are less well off.

Whereas the European economy is now slowly rebounding, the Eurozone has trailed other EU MSs. Overall the global recovery has out paced Europe's lacklustre performance. Emergencies and incidents are handled quite efficiently, and new private care providers, that originally only served the very wealthy, are now also providing more and more service to people that are less wealthy, for instance because their employer provides this extra care service. The increased pressure on the "old" traditional care providers has resulted in a situation where the public health care sector is in a crisis, and new solutions need to be found

The Central Care Society

March 26, 2020

- ***PREVENTION. Health care delivery happens not only to resolve health issues, but prevent them.***

Health prevention is the focus of this society. Individual citizens feel that taking a preventive approach to health will, on the one hand, diminish their chances of suffering from common 21st century chronic diseases and, meanwhile, policy makers and health service managers believe that it will reduce the time and resources needed. The awareness of prevention is conspicuous in people's behaviour, with the majority of the population following a strict diet, regular exercise and frequent 'psycho-social' sessions (not least because they are aware of the costs of failing to do so). Awareness is further heightened through networks (incl. virtual networks) and collaborations in health between individuals, the public and the private sector.

- **PATERNALISTIC/ COERCIVE SOCIETY**. ***A 'social' Europe, but at the expense of more (patient) obligations including adoption of health/ social care related measures.***

The crisis and post-crisis years brought about significant policy changes. Most significantly, citizens believed that only if markets were tamed could they be stable and benefit the whole population. They voted for a 'social' Europe, with governments responsible for providing health and social care and, overall, adopting a 'paternalistic' role towards society. However, the bigger role of the public sector has entailed higher costs. To address these, governments have required citizens and businesses to adopt a more preventive attitude towards health in order to mitigate risks and costs. For example, at the European level, companies need to contribute to reducing healthcare costs by offering health promotion measures, and even some health interventions, at the workplace. Fortunately, the policy has positively affected business competitiveness, which has increased after their costs decreased due to the higher morale and the lower rates of absenteeism deriving from the new policies. Both health professionals and patients claim to feel cared for but fear for their loss of freedom.

- **INTEGRATION of CARE**. ***Data on patients is shared seamlessly across organisations.***

Socio-economic factors and technological factors have pointed towards an integrated health care system, where data on patients (including on prevention, i.e. healthy lifestyle, social care and health care) are being shared across and accessed from different organisations. On the social side, the ageing society has been a major influencing factor. Affordable health care has been achieved through continuous nudging towards healthy options along with health monitoring supported by a variety of technologies such as tele-health, the internet and other ICT related technologies.

- **LOW ADOPTION RFID**. ***RFID is not a widely adopted application, but is used only for 'logistical purposes' and mainly in the pharmacy sector.***

The great opportunities offered by RFID to identify people, whether for health, crime or other social purposes, got lost after several cases of misused information were identified in 2012. In fact, polls suggest the effect on public opinion has been enormous. Low adoption of RFID is also a direct consequence of the inability of RFID providers to convince governments and agree on a set of common standards to achieve economies of scale and major initial investment costs. As a result, the market

is fragmented and providers cannot sell sufficient quantities at competitive prices. Despite the use of RFID across different industries, in health RFID is only widely used in the pharmaceutical sector. The pharmaceutical guild has been able to work jointly to respond to changes affecting the industry. They have agreed to set standards and include RFID as part of their core IT strategy. With RFID, pharmacies can improve dosage, drug and patient validation of drugs, supply chain logistics, and support inventory management. All these features offered by RFID have been key in helping the pharmaceutical industry adapt to the changes in the new market structure affecting them: a market where small pharmacies have disappeared, big chains have survived and e-pharmacies have expanded.

Appendix 2: Workshop agenda

Preparation
No preparation required. The workshop is intended to be fully interactive, drawing on individual expertise of participants. The meeting itself will therefore require active involvement of those present, and their ability to actively and creatively engage with a picture of a possible future.

You will be sent a draft report on RFID applications in healthcare depending on the state of feedback from the European Commission. This report is for background reading only.

Agenda
In order to be able to have two cycles of parallel sessions, we will ask people to plan to be there for a full day, starting promptly at 0900 with the programme, ending at 1700 with concluding remarks and after that drinks.

0830 registration at Avenue de Beaulieu 33
0900 welcome, what are we going to do, introduction of participants
0930 presentation of results so far
Q&A
1000 coffee and start of parallel sessions
Parallel sessions per scenario (participants divided in 3 groups)allocation of roles: care provider, patient, ICT supplier, government; Introduction of scenario;
SWOT
1200 Buffet lunch
1245 Plenary: feedback per session on SWOT
Discussion on commonalities and differences
Tasking for afternoon parallel session explained
1400 Parallel sessions per scenario
Looking back from the future
Discussion on what the specific challenges are, and what should have been done in the past (i.e. 2009)
1530 tea
1545 Plenary: findings per actor
Discussion, cross validation
1700 Conclusions, closure
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Appendix 3: Workshop Participants

Britton	Jason	Royal Alexandra Hospital, Paisley, Scotland
Ciolan	Catalina	European Association of Healthcare IT Managers
Chabannon	Christian	Institut Paoli-Calmettes Biotheque / Tumorotheque / Centre de Ressources Biologiques en Oncologie Centre de Therapie Cellulaire et Genique. Departement de Biologie
Christ	Oliver	SAP
Dahm	Rolf	n-Tier construct GmbH
Frederix	Florent	DG INFSO
IMURA	Ryo	Hitachi Ltd, Tokyo University
Segeroth	Peter	Siemens AG, Siemens IT-Solutions & Services: Auto ID/RFID solutions
Oehlmann	Heinrich	European Health Industry Business Communications Council
Pechakova	Hana	DG JLS, C 5 Data Protection Unit
Ranger	Chris	National Patient Safety Agency
Srivastava	Lara	ITU
Trebar	Mira	University of Ljubljana, Faculty of Computer and Information Science
Mezzour	Saad	ETSI EP EHEALTH Chairman / Medtronic
Koch	Oliver	Fraunhofer - Institute for Software and Systems Engineering
Warwick	Kevin	University of Reading KTP Centre
Kabisch	Bjorn	Jena
Haugeto	Ase Kari	Norwegian Board of Technology
MacMahon	Stephen	Irish Patients Association (representative to the International patient groups consortium)
Luciano	Ana Gil	DG INFSO
Giampieretti	Roberto	DG INFSO
Waldemar	Jaronski	DG INFSO
Atzor	Sabine	DG Enterprise
Munoz	Rodolphe	DG Enterprise
Sgarrella	Mario	DG Enterprise
Aarnio	Jaakko	DG INFSO