BEYOND EXPERT REGULATION FOR DEMOCRATIC TECHNOLOGY. THE CASE OF RADIO FREQUENCY IDENTIFICATION TECHNOLOGY

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SYNOPSIS

Keywords: technology governance, democracy, expertise, technology assessment, RFID.

In this thesis, the way in which the process of governance of new technologies is addressed by different states is examined and the framing of this process is analysed. To achieve it the answers to the following questions are sought and provided: how can the perception of technology influence the governance process? What is the role of scientific experts and civil society in this process?

The research is based on the analysis of three reports of RFID technology. These are the study on "Security Aspects and Prospective Applications of RFID Systems" conducted by the German Federal Office for Information Security, "RFID Radio Frequency Identification: Applications and Implications For Consumers" report from the American Federal Trade Commission, and "Radio Frequency Identification" report issued by the British Parliamentary Office of Science and Technology. By analysing these reports I intend to identify the differences and similarities in the RFID technology vision and the process of its evaluation which might influence the respective policy. It should be emphasised, the number of the reports concerning RFID technology is still very limited. However, the careful and detailed evaluation of the three main reports should provide an ample source for the analysis.

In addition, the institutional conditions which must be satisfied to open the debate about technology, and for democratic, deliberative governance to take place are explored.

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1 INTRODUCTION

Diversity and complexity of modern society, combined with constrained capability of political systems to handle technology development, have lead to reconsideration of the standard democratic models of governance. "As the tasks of the state have become more complex and the size of polities larger and more heterogeneous, the institutional forms of liberal democracy developed in the nineteenth century – representative democracy plus techno bureaucratic administration – seem increasingly ill-suited to the novel problems we face in the twenty first century" (Fung, Wright, 2001, p.5). In the standard democratic model, decision-making takes place after the experts have provided their opinion and objective facts. The crisis of trust in scientific expertise as a source of neutral and objective information has recently been especially apparent: the BSE affair or emergence of AIDS activism are the vivid examples (Jasanoff, 2003; Epstein, 1995). Undermined scientific authority also leads to the erosion of trust in politics and policy advice. Moreover, it has been recognised that this model is rather incomplete and unsatisfactory when "…the facts are to deal with aspects of value to aid the decisions on the same values…"(Strand et al., 2005, p2). Consequently, the standard model is facing a crisis of trust, scientific authority, and legitimacy. "For this reason, the concept of 'governance[1]' has been introduced as a wider vision of management and government that includes the public in new and more direct ways along the process" (Ibid.).

In this thesis, the problems which modern governance faces, namely how new technologies are evaluated and dealt with from the governance perspective will be addressed. For this purpose, the example of Radio Frequency Identification (RFID) technology will be used. Having closely followed debates on the implementation of RFID tags in passports, triggered by the September 11th terrorist attacks in the USA, my interest regarding this technology started to develop. However, there is also another reason which prompted me to take a personal interest in it, namely the obligation to inject an RFID tag into my pet cat, in order to travel across EU member states. These reasons may sound trivial, but they encouraged my initial interest and since then, I have been closely following the development of RFID technology. Moreover, having consulted my supervisors on these interests, the decision to use

[1] For the explanation of the concept of governance, see Glossary.

RFID technology as the case study has become even more appealing as it will allow me to address and analyse the process of governance ‘in the making’ due to the fact that this technology is only now becoming more widely used and debated.

RFID technology is already widely used in areas such as access control, transport and logistics, supply chain management, real time location, and many others[2]. 600 million RFID tags were sold in 2005 alone, but this market is expected to grow exponentially, with sales anticipated to increase 450 times by 2016. RFID technology is expected to "…open up tremendous opportunities for both economic prosperity and the quality of life …" (Reding, 2006). However, apart from the expected benefits, the use of RFID also raises major issues in the areas of privacy, security, health, the environment, and employment. These concerns have given rise to the opposition towards this rapidly developing technology. For example, such resistance has resulted in the withdrawal of RFID tags from Benetton’s range of products.

Yet, the industry, scientists and policy-makers often regard this opposition as irrational, biased, and badly informed. They call for more education, which underlines the assumption that scientists and engineers possess the only true and objective knowledge about technology, which must be disseminated. Scientific knowledge therefore, perceived as universal, imposes norms and influences the way in which technology is perceived and governed (Wyatt, 1998). Public decision-making on technology often relies greatly on science and scientific perception, considering that only scientists can make rational decisions about science and technology. Consequently, in cases of controversies, the tendency to reduce a problem to a scientific or technical one can be observed. However, as the recent technological controversies over, for instance, Genetically Modified Organisms (Eike, 2000) demonstrate, society no longer agrees to leave the decisions about science and technology to scientists and policy-makers. This is in line with the fundamental assumption of STS scholars, who underline that despite the widely held technologically deterministic view on science and technology, they are parts of society and are socially constructed.

[2] For the full list of RFID application see appendix 2.

However, in this work, the assumption concerning RFID technology is that the debate surrounding it is limited to issues of privacy and security, thus to the scientific, technical and legal perspective, whilst debates concerning social meaning, ethical and cultural issues have been disregarded. The framing of science-based evaluation may affect the way in which policy-makers view the technology and its policy.

1.1 Aims and objective

The objectives of this thesis are to examine and evaluate how the process of governance of new technologies is addressed by different states and to analyse the framing of this process.

To achieve these objectives I intend to find answers to the following questions: how can the perception of technology impact the governance process? What is the role of scientific experts and civil society in this process? In addition, I aim to explore which institutional conditions must be satisfied to open the debate about technology, and for democratic, deliberative governance to take place.

The research will be based on three reports analysis. These are the study on “Security Aspects and Prospective Applications of RFID Systems” conducted by the German Federal Office for Information Security, “RFID Radio Frequency Identification: Applications and Implications For Consumers” report from the American Federal Trade Commission, and “Radio Frequency Identification” report issued by the British Parliamentary Office of Science and Technology. By analysing these reports I intend to identify the differences and similarities in the RFID technology vision and the process of its evaluation which might influence the respective policy.

1.2 Method

To achieve my objectives literature and articles have been reviewed and studied in order to get an insight, present, and evaluate the current debate about science and technology governance, technology assessment and RFID technology.

Empirical material gathered from case study on RFID technology will allow for the examination of how the governance of technology is currently framed by national states, and to assess these patterns of governance through the concepts of democratic governance analysed in the theoretical chapter. The reports will be evaluated using an analytical tool proposed by O. Brekke, E. Eriksen (1999) in their article “Technology assessment in a deliberative perspective” and the comparative analysis of the reports will be performed.

This will be followed by a proposal of a discussion regarding the institutional conditions required to establish a democratic governance of technology. The various theoretical frameworks have been studied complementing my founding from the previous chapters with the intention of contributing to the debate about the problems of modern governance.

1.3 Outline

Having presented the method and aims of this thesis, the theoretical framework which will conceptualise technology governance, will be presented in chapter two. This will allow the investigation of the empirical material gathered to achieve my objectives. In chapter three, RFID technology will be introduced with the intention of facilitating the understanding of the debates surrounding it. Next, in chapter four, the analytical tool will be introduced, followed by the presentation and analysis of three reports. The problems of governance from a normative perspective will be addressed in chapter five, followed by the conclusion, in which the findings will be summarised according to my initial aims and objectives. This will be followed by the references and annexes.

2 CONCEPTUALISING TECHNOLOGY GOVERNANCE

Abstract

At present, the political systems are lacking the mechanism that would enable them to reconcile various interests of all actors and create the strong foundation for technology policy. A lack of uncontested factual expertise, the growing wish of citizens to participate in the decision-making process, restricted capacities of the political system to steer technology development, and the diversity and complexity of the modern society all lead to the reconsidering of our modes of science and technology governance. (Bellucci et al 2000; Goujon & Dedeurwaerdere, 2006).

Consequently, in the following chapter, the existing modes of technology governance, their relation to democracy, and the reasons for which we need to rethink these current patterns will be evaluated.

2.1 Technology and modernity

During the last two centuries, science and technology have seen immense growth and success, and have become driving forces of global development. At the same time, they have created a great amount of unintended and dangerous consequences. In 1984 Charles Perrow forecast a series of inevitable accidents which he entitled "normal accidents", which occurred during the last decades of the twentieth century, that is the chemical plant disaster in Bhopal in 1984, the nuclear plant catastrophe in Chernobyl in 1986, and the loss of the Challenger shuttle in the same year, the Bovine Spongiform Encephalopathy (BSE) crisis and many other disasters. (Jasanoff, 2003). Such accidents have caused social disagreements over technological developments and innovations and have drawn great attention to their impact.

When a technological disaster happens, numerous questions are asked: could it have been avoided?; if there was a better assessment of risks, could the danger be eliminated?; what should be done to avoid such accidents? Such questions are clearly relevant to technology assessment and to democratic decision-making on the development of technology (Schwarz, 1992). Furthermore, controversies often expose the tensions between stiff, technical and institutionally framed definitions of problems and broad public understanding of the same problem (Weldon, Wynne, 2001).

Against this background, the need for regulation which would both control and promote science and technology has emerged. Moreover, social disputes triggered by technological innovations such as GMOs, have shifted the debate about science and technology from narrow political and scientific spheres to the broader public one. Today, this debate is framed in more general terms as governance (Abels, Bora, 2005).

At the end of twentieth century, the problem of governance drew the attention of the European Commission. During this time, the Commission was commencing the discussion about the crisis which the traditional form of governance was facing. (Boudourides, 2003, pp.1-3). There were numerous reasons for opening such discussions, such as *"…growing awareness of societal complexity; an increasing difficulty for effective policy-making; challenges of credibility and legitimacy that governments and other regulatory institutions were confronting; and an emergence of new modes of governance."* (Ibid, p.2) New forms of non-hierarchical, decentralised and cooperative regulation (network governance) are replacing old models of direct intervention based on centralized top-down modes of policy-making (Cohen & Sabel, 1999; Smismans, 2006). Consequently, modern societies, characterised by diversity and complexity, have started to pose a challenge to the top-down approach of governance and its limitations, and have started the search for an alternative way of dealing with the governance of technology (Boudourides, 2003). Such an alternative was Technological Assessment, some models of which "…attempt a bottom-up approach to technological choice by providing the parties affected by new technologies with an early and influential voice in technology development" (Bimber, Guston, 1998, p. 8).

Expert advice is one of the sources which facilitates the process of governing science and technology. The policy decisions are often based on experts' advice. However, as mentioned above, numerous controversies have caused a lack of trust in scientific knowledge and hence politics, and have highlighted the need for democratic transformation. "Science, technology and politics seem to have lost credibility and authority, giving rise to a mix of distrust, protest and alternative problem-solving strategies" (Hage et al., 2006, p.4). Consequently, new modes of governance, which increase the acceptance and legitimacy of decisions, recognise common interests, and create new methods of conflict resolution, are emerging. However, the emerging perspectives of governance will be discussed in the further chapters of my thesis, confronted with the analysis of RFID reports. From the perspective of governance, arguably the major emerging issue is that of democracy and the role of expertise in modern society, namely, what kind of expertise contributes to the process of governance of science and technology?; how credible and legitimate the expert advice and consequently policy advice are? These issues will be addressed in the next parts of this chapter.

Firstly, the description of different images of technology and its relation to society will be outlined. It will be commenced with Technological Determinism, which is still the prevailing image of science and technology, and still informs present discussions about technology, democracy, and experts (Bijker, 1995). In the next part, the Constructivists' perspective on science, technology and society, which clearly demonstrates insufficiency of the deterministic approach, will be demonstrated. The understanding of various approaches and images of technology is crucial due to the fact that the way in which technology is defined or viewed could determine the manner in which actors deal with technology, its problems or technological controversies. Consequently, the issue of expertise and public involvement, hence democracy, will be raised followed by presentation of M. Callon's (1998) Models of Technical Democracy and Joly's (2001) typology of Innovation and Risk Governance. One of the methods which attempt to modify the traditional approach of technology governance is Technological Assessment. Technology Assessment is the method which advocates wide participation in the development process of technological artefacts. However, it is rather a generic concept and the process of assessment, as well as its structure, outcome, and legitimacy, are dependent on institutional context and arrangements. A brief history of this method will be presented, followed by a description of the different methods of TA, as well as the analysis of its meaning, structures and procedures.

2.2 Technology shapes Society

As mentioned above, Technological determinism is still very potent and influential theory of the relationship between technology and society. Technological determinism attempts to explain the process of social development and change in terms of one principal or determining factor – technology (Chandler, 2000). The idea that technology is a major governing force is believed to go back to the times of the beginning of Industrial Revolution[3]. As L. Fuglsang (2001) underlines, the role of science and technology as a driving force of economic and societal change was strongly advocated after World War II. Amongst others, the influential position of science was highlighted by Vannevar Bush, the US president's advisor for scientific research and development, who regarded "basic research…[as] the peacemaker of technological progress" (Sismondo, 2004, p.75). B. Bimber (1994) emphasises that this view of technological development and its impact on the structures of society has been, and still is, widely held: "Technological determinism seems to lurk in the shadows of many explanations of the role of technology in human history" (Bimber, 1994, p. 80). Whereas, W. Bijker (2001) underlines that technological deterministic view is "…the standard image of science and technology – an image still widely held by citizens, students and practitioners" (p.21).

"Technological determinism focuses on causality - cause and effect relationships - a focus usually associated with 'scientific' explanation." (Chandler, 2004, p.4) Consequently, it entails reductionism, which tends to reduce a complex whole to the effects of one part (or parts) upon another part (or parts) (Ibid.) According to this approach, scientific knowledge is regarded as objective and neutral, discovered by scientists, whereas technology is viewed as an application of scientific knowledge and autonomous force in society. Moreover, cultural, political, and economic changes are all caused by, and continually shaped by technological and scientific development. However, technological development is not influenced by any external forces, and instead develops autonomously, following its own inner logic. Scientific knowledge, which is independent from any kind of social, political or economical influence and

[3] For the information on the process of development of the Technology determinism approach see Smith M.R. (1994) "Technological Determinism in American Culture ", in Marx &Smith (eds) *"Does Technology Drive History? The Dilemma of Technological Determinism"*, MIT Press

consequently does not mix facts and value judgements (Joly, 2001) is presented as a tool for solving all types of problems. Furthermore, technological problems which are created by new technologies could be also solved by experts who will create newer technologies.

Another aspect of this perspective which is significant for this thesis is that it “cannot be subject to ‘outside’ control in the form of policy making or political debate” (Bijker, 2006). This obviously results from autonomous technological development, free of any kind of influences.

2.3 Heterogeneous ensembles

Clear limitations of Technology Determinisms resulted in reconsidering the relationship between science, technology and society and in the 1970s and 80s the empirical research on scientific practice modified the way in which science and technology were perceived. This resulted in the formulation of a constructivist perspective on science and technology. Science technology and society were analysed as “an intimately interconnected, heterogeneous ensemble of technical, social, political, and economic elements” (Bijker, 1995, p.249). Three different approaches which viewed science and technology in this way were developed during that period: The Large Technological System approach (Hughes, 1987), the Actor Network theory (Latour, 1987), and the Social Construction of Technology approach (Bijker et al, 1989).

All of these approaches attempted to explain how a variety of technical, social, economic, and cultural factors shape technological development. These approaches “stress that technology does not follow its own momentum nor a rational goal-directed problem-solving path but is instead shaped by social factors” (Bijker, 2001, p.26). Despite differences in approaches and terms, the core and common aspect of these perspectives is that technology is not seen as an external and independent object, but instead is an integral part of the society, or of the heterogeneous networks of human and non-human actors (Latour, 1987). Technology is product of ongoing social interaction, design, political choices and compromises in this perspective. Development of technological artefact cannot be explained solely by intrinsic properties of a technology, but instead by also including the meanings attributed to a technology by various actors or relevant social groups. This encompasses the concept of interpretative flexibility of a technology, namely the meanings which are given to it by different actors , how it is interpreted by them. (Bijker, Pinch, 1987)

Furthermore, the development of scientific knowledge is viewed as a social process. The constructivist perspective provides a foundation for a politics of technology. The interpretive flexibility of an artefact demonstrates that "…the stabilization of the artefact is a social process, and therefore is a subject to choices, interests and value judgements -…to politics. Without accepting interpretive flexibility of an artefact, one is compelled to accept a technologically determinist view" (Bijker, 2001, p27); this in turn can affect the diversity of actors participating in the decision-making Wyatt (1998).

2.4 State, Democracy and Expertise

"The question who should be involved in policy- and decision-making and what is the proper relationship between experts, lay-people and politicians is fundamental to democracies" (Abels, 2002, p.2). As underlined by Bellucci et al. (2000) in the EUROPTA report published by the Danish Board of Technology, the role of the state concerning technology policy is dual, and it is confronted with opposing demands:

- Firstly, the state should promote science and technology with the purpose of fully utilising the benefits of new technologies. It is expected to support the implementation of new technologies as well as public acceptance.

- Secondly, it is the state which is responsible for the regulation of the application of new technologies and minimising or avoiding unintended negative consequences. The state is expected by society to control risks and protect their interests.

In order to accomplish these dissimilar missions, the state relies on external expertise. As a result, in numerous instances, expert knowledge, which in most cases is scientific or technical knowledge, is used as a means of legitimising political choices and decisions, solving policy problems, and making policy viable. (Bora, 2005) Nevertheless, "…what science is supposed to provide politicians with, namely factual knowledge as a basis for decision-making in situations of uncertainty, is precisely what science cannot provide. The question "how safe is safe enough" in the case of risky technologies cannot be answered factually by science" (Bellucci et al, 2000, p. 20). As a result, scientific knowledge is becoming less credible and is often contested. Many voices in STS studies have stressed the importance of the involvement of lay knowledge into the policy-making process and the democratising of technology. (Bijker, 1995; Durant & Joss, 1995). These scholars underline the fact that the design process of a technological artefact involves much more than solely scientific or engineering knowledge. Furthermore, the development of scientific knowledge itself is viewed as a social process. Therefore, the question arises as to which kind of expertise currently contributes to the process of technology governance. To answer the question, M. Callon's (1998) offers three forms of technological democracy which will be presented, detailing different forms of relationship between knowledge and society. However, P.B. Joly (2001) developed these forms further, offering Four Models of Innovation and Risk Governance, which will be introduced after M. Callon's Models of Technological Democracy.

2.4.1 Models of Technological Democracy

What differentiates one model from another is the scientists' degree of monopoly - hence the degree of non-experts' involvement - in the elaboration and implementation of knowledge and know-how which influence the decisions. The three models show that the proportion in the mix between experts and laymen can lead from small to large influences when it comes to making a final decision. (Callon, 1999)

- ***Model of the Public Instruction***. This model is the simplest and the most commonly used model of technological democracy. Within this model, scientific knowledge is perceived as universal and objective, as opposed to the knowledge of lay people, which is regarded to be prejudiced by irrational beliefs and superstitions. Not only do scientists need to teach the public, but there is also nothing which they can learn from the public themselves. Experts do not acknowledge the usefulness of local know-how and do not consider it to be a source for learning.

The link between scientists and citizens is indirect: it is the state which represents citizens and their will to the scientists. Science is considered to be autonomous, but not independent: it is submissive to the control of authorities and compliments the innovation plans of businesses. In this model, risks linked to technoscience exist in two forms: an objective form and a subjective form. Objective risks are represented and analysed by the scientists, who allocate likelihood to certain events and identify factors of risk. Subjective risks are the risks which laymen imagine independently of any reference to certified and objective knowledge.

The crucial element of this model is the lack of trust between society and scientists. This originates from the fact that rationality is attributed solely to scientific knowledge. Other forms of rational thinking are not acknowledged. Information and education of the public is considered to be the goal of policy.

- ***Model of the Public Debate.*** In this model, expert knowledge and the knowledge of laymen are both regarded as relevant. The implementation of this model has been based on the assumption that there are diverse groups of actors in society, each of these groups possessing its own knowledge, and that the knowledge of one group can complement the knowledge of the others. A local knowledge is considered to be a valuable supplement for the enrichment of the universal scientific one. As opposed to the first model in which information and education of the public by experts is seen as the source of legitimacy, in this model a public debate is considered as the source of legitimacy. Relationships between scientific experts and the public are now based on public debates. The exchange of views and opinions which takes place during such debates can contribute to an elaboration of the knowledge of both experts and lay people. Such public debates could occur in various forms: as inquiries or hearings, “focus-groups”, citizens’ conferences and many others.

  Disagreements between scientists and lay people are commonplace within this model. Agreements are obtained by the process of negotiation and compromise, and as a result the knowledge of opposing sides becomes enriched.

However, the model of public debate also has drawbacks. One of the most difficult problems to solve is that of representatives, namely, who should participate in such debates. In the instances when the interests of particular stakeholders are well represented but those of another group are underrepresented or not represented at all, controversies may not be solved.

- ***Model of the Co-production of Knowledge***. In this model, great importance is attached to the role of the non-specialists in the production of knowledge and know-how. It tends to actively involve laymen in the elaboration of knowledge. In this model, local knowledge is included into the process of knowledge production. Unlike in model 1, scientific and non-scientific knowledge are not radically incompatible, they are rather the combined result of the same process in which different actors, specialists and non-specialists closely cooperate.

  The co-production of knowledge is demonstrated by a specific arrangement of involvement of 'concerned groups,'(Callon, 1998, p.5). The examples of such groups could be patient organizations, which are becoming increasingly involved in scientific research on their diseases. "The legitimacy in this model, in which new knowledge is worked out, comes from the mobilization of appropriate actors and on the capacity of concerned groups to acknowledge the relevance of their actions." (Audétat, 2000, p.8)

Consequently, each of the presented models describes an original form of technical democracy consisting of a specific manner of knowledge production, and of actor participation in this process, the relationship between specialists and laymen, as well as the conditions of effectiveness and legitimacy of decisions taken. Based on M. Callon's models P.B. Joly (2001) developed his typology of Innovation and Risk Governance, which takes into account the observed modes of governance and the existing social theories.

2.4.2 Four Models of Innovation and Risk Governance

- ***The Standard Model*** In the first model, the disagreements between the experts and the public are perceived as irrational due to the public's lack of knowledge.

There are various reasons for the public being considered irrational such as cognitive bias, the lack of comprehension of technical subjects, and aversion to novelties and risk. This model fits perfectly into the classical distinctions between facts and values. Experts have an objective scientific approach to risk whereas the risks perceived by the public are marked by a greater degree of subjectivity. Several essential elements characterise the functioning of the first model:

1) It is necessary to preserve the purity of expertise by not combining the facts and value judgements. Expertise is based on science and is independent from political, economic and social influence.
2) Trust is a central element for the functioning of the system. It is the condition of the delegation of a decision to institutions. Different mechanisms can contribute to the construction of trust. In this model, it is considered that trust gives credibility to institutions and that it is better to contain problems rather than to draw attention to them.
3) The difference in perceptions between experts and the public can be reduced by means of education. It is supposed that people who have more advanced knowledge, especially in scientific disciplines, understand better and adopt experts' arguments. In this model, risk communication plays an important role. It is related to a one-way method of communication since the experts have little to learn from the public. The objective is to reassure the public to perceive the benefits concealed behind the risks.

– ***The Consultation Model*** This model brings into question the fundamental thesis of the first model, namely the opposition between the irrational public and the rationality of the experts. The distance between experts and non-experts is not connected with the level of knowledge, but with the difference in the perception of risk. The public asks wider questions with regard to risk because they are no longer confronted with abstract scientific theoretical risk, but with real risk. It is no longer correct to consider that only experts are rational. Moreover the experts' perception of risk takes into account their connections with industry and commercial interests etc. The elements which constitute this model are:

1) Voluntary or involuntary exposure to risk. A risk taken voluntarily is more likely to be accepted. Conversely, an involuntary risk is less likely to be accepted.

2) The unknown character of risks. The risks which are invisible, unknown, or new, are less acceptable than those which are more familiar. Here the notion of uncertainty becomes central and opposes the notion of danger.
3) The number of people affected by risk. The risk which may affect only a small specific group is more likely to be accepted by the wider population.

The solutions of the second model are different from those of the first. Risk communications and risk management are based on a two-way process. Both the experts and the public have valid views and opinions to contribute. Each side respects the opposition’s insights.

In the second model, trust is incompatible with a closed, confined, or secretive attitude. To establish trust the public needs to participate in the decision process. Only by engaging the public can regulatory institutions gain legitimacy. However, like the standard model, the model of consultation is conditioned by the positivist vision of science. In practice, there is a clear distinction between public opinion and the scientific opinion of experts. The public, still seen as irrational, is engaged only in risk management but not in risk definition.

– ***The Standard Model Revised.*** The first two models are based on the atomistic perception of society. The public opinion is seen as a kind of data – the aggregation of individual opinions, and not like a social production, the result of confrontation of different social groups on the public arena. In this way, the question of the social construction of a problem is omitted.

  In the third model, which is the extension of the first one, the emphasis is placed on the interaction between the regulation process, social groups and media. The Breyer’s (1993) model of vicious circle of risk regulation is a good illustration of this model. For him, the legislative process is caught in a vicious circle with the source of the problem being the public attitude towards risk and uncertainty created by the media. Breyer claims that public perception of risk is usually inadequate. Risks are often overestimated, however the efforts to educate the public about scientific risks have failed and will fail in future. Consequently, responding to public attitude, legislature itself will exaggerate the risks and

"…combined with an institutional inability to set detailed, scientific standards, will cause inconsistent, random, and often irrational ...lawmaking" (Zubler, 1994, p. 243). As a result, the public will feel unprotected by law and decision-makers, which will lead to more political pressure to take action. (Breyer, 1993; Zubler, 1994).

In this model, public influence and participation in risk management are considered with great suspicion. Accordingly, risk management includes the following elements:

1) Delegation of risk management to a competent and independent administrative body (in order to avoid the influence of media, pressure groups and politics)
2) Clear distinction between risk assessment and risk management.
3) Risk cannot be measured in an abstract way but rather analysed, comparing various action scenarios, respecting the general principle of coherence and introducing the economic dimension.
4) Trust is not connected with openness, but rather with reputation and competence.

Consequently, the third model corresponds with the technocratic vision. The bias against industrial lobbying, polarisation of public opinion and groups of interests, and reinforcement of independent scientific expertise, represent the elements of the traditional top-down approach.

- ***The Model of Co-construction.*** This model distinguishes itself by questioning the way in which science uses experts. Representations of science come from numerous collected case studies. The works of the new sociology of sciences have progressively come to blame the traditional conception of science as a revelation of universal, independent truths of the social system they produce. This important work results from taking the methodological path proposed by Latour. It is therefore a criticism of sound science, which 'melts' the analysis of risks in the preceding models, and which invites us to place it into a pragmatic perspective. The most important ideas of this model are:

1) The idea of independence between facts and values (the neutrality of science) grows blurred if one considers the invasion of the world by the hybrids. Sciences have themselves become techno-sciences in the sense that their capacity of investigations is constructed sequences of prior decisions or the by the intervention of economic, social and technical choices. Sound science, supposedly neutral and objective, is often dependent on context and frequently involves value judgements.
2) A second important idea is that of distributed knowledge. There may not only be one scientific explanation to a problem, but several. Different disciplines are most likely to have different ways to construct critical questions, to arrange the questions, and to determine relevant experimental protocols to reject such a hypothesis. The criteria of choice which may allow for the selection of one interpretation over another are not clear. However in numerous cases, the distribution of knowledge does not limit itself to lone scientific licences. Examples such as AIDS patients (Epstein, 1995) show how simple citizens or associations contribute through their knowledge of the issue.
3) The third important idea is that of translation. All scientific knowledge is gained locally in an experimental way which allows for the representation of natural phenomena. While simplifying them in order to study them, the use of scientific results in the real world requires, in return, a new translation. This is so delicate that often, translations are not immediate: how does one convert observations in a laboratory, during a given period, into long term predictions for the big picture? What is the relevance of an in vitro test or research on an animal to test the toxicity of a substance for mankind.

These characteristics of science and technology are emphasised in situations of scientific expertise. Mobilising scientific knowledge to respond to questions from the public, systematically places those who pose the questions into a long chain of translations. In a situation of expertise, science should cross its own knowledge boundaries and express its own conviction. This position is generally accepted today, at least by scientists who have experience of situations of expertise. In this model, both facts and values being taken into account, as underlined by Stirling (1999), is not only a democratic matter; it is a matter of analytical rigor because it is the only way of treating these essential points seriously. If not, how can we criticise and validate the framing? Why hide and withdraw from the debate which will discuss what may eventually be changed?

Similar to the Model of the Public Instruction, the first three models by P. B. Joly fail to take into account public knowledge and attitude towards new technology. Decision-makers rely on scientific knowledge and practice. However, with the growing amount of controversies, which means conflicts of different interests and rationalities "…expertise conducted in the standard view is inevitably perceived as unreflective, biased, giving way to the interests of the actors with the highest degree of inclusion in the issue, and excluding others, especially lay people" (Audétat, 2000, p.6). Consequently, the public and its opinions can no longer be disregarded. New solutions which would connect expertise and lay people's knowledge are being sought, which is in line with the constructivist approach, the core of which is the active social shaping of technology. One of the methods of such an active social shaping of technology is Technology Assessment (TA), which tries to identify the risks and benefits of new technologies to society by taking the view of the public into account (Senker, 1999). TA links the public and politics and is supposed to increase the democratic foundation of decision-making. Consequently, participation in TA becomes a prerequisite for democratic politics. However, initially TA was exclusively a science-based process, thus the origins and development of TA procedure will be considered in the next part.

2.5 Technology Assessment

2.5.1 Origins

Technology Assessment was initially introduced as a solution to the problems "created by new technologies". Among such solutions, there were scientific expert advisory committees, an increased amount of scientific research and peer review (Bijker, 2001). Technology Assessment begun in 1972 with the establishment of the Office of Technology Assessment (OTA) in the USA. The purpose of this institution was to provide policy makers with a neutral and competent assessment of the prospective benefits, costs, harmful effects, and risks of new technologies. The purpose and approach chosen for TA is in line with the general deterministic attitude towards technology in the USA during that period. “The agency’s role was seen as an ‘early warning device’, providing foresight about the possible positive and negative consequences of technological developments” (Bijker, 2006). However, the problems with providing decision-makers with impartial assessment very soon became apparent. It became clear that Technology Assessment was not free of value judgement and dependence on socio-political options. Moreover, it was obvious that in a diverse modern society, political process of choice could not be determined by a single ‘objective’ view of the ‘technological problem’ (Schwarz, 1992). “Therefore, the way the scientific experts frame a given problem may not reflect adequately the variety of world views in a given society” (Assouline, Joly, 2001, p.16). Congress decommissioned the Office of Technology Assessment in 1995.

2.5.2 Technology Assessment in Europe

The weakness of the American TA process based on the process of communication between scientists and decision-makers has posed a challenge for TA, and has provided the grounds for the incorporation of participatory methods in TA. “Participation is seen to provide a cognitive, normative and pragmatic basis for socially legitimate decisions under the conditions of a dynamic process of technological development, the uncertainty of knowledge and contested values” (Bellucci et al, 2000, p. 23). Therefore, in Europe, many Technology Assessment institutions inspired by the OTA have been developed with the aim of identifying, increasing, and implementing the informed public choices and preferences about technology and policy, contrary to the OTA’s narrow and mainly scientific assessments. For instance in Denmark, TA was initiated “in order to integrate the views, the interest and values of all stakeholders, including "lay citizens", in the assessment process of technological developments and related policy options” (Assouline, Joly, 2001, p. 17). The importance of the Danish experience has been widely acknowledged and, as a result, TA was developed in various countries in numerous different models. Following Bellucci et al (2000, p. 23) the need for participation in TA has been justified as follows:

> • *Firstly, TA requires the knowledge input from those affected, in order to support political decision-making which is well-informed and which takes into account the whole spectrum of a problem.*

• Secondly, the interests and values of those affected as well as the inequality in everyday life to make their view heard must be taken into account if political decision-making is to be considered legitimate and, consequently, stand a chance of gaining social "acceptance".
• Thirdly, participation creates an arena where conflicting claims can be reconciled, and a playground where new solutions can be developed and deliberated upon.

2.5.3 Technology Assessment Methodologies

Various Technology Assessment initiatives have been implemented across Europe. They have been sponsored either by the government, Parliaments, or autonomously, and various methods have been designed with the aim of providing policy-makers with a Science and Technology advisory service. (Cruz Castro & Sanz Menendez, 2003) These methods are presented in the following table:

Appraisal process	***Some key characteristics***
Consensus Conferences	Typically involves less than 20 individuals, usually selected on the basis of a random process, stratified to account for basic demographic factors. Involves a series of meetings over a protracted period of time, to which representations are made by different interests groups and specialised witnesses called to a final public conference, with participation by the audience and attendance by the media. Consensus is regarded as a desirable outcome, but (depending upon the context) is often not a requirement - the expression of dissenting views being possible in the final report.
Citizen's Juries	Typically involves less than 20 individuals, usually selected on the basis of a random process, stratified to account for basic demographic factors. Involves a series of meetings over a protracted period of time, which are generally more private than those of consensus conference, with specialist witnesses being called, but no final public conference or media involvement. Generally less focused on achievement of consensus than a consensus conference - dissenting minority reports may be written.
Scenario Workshops	Similar model to citizen's juries, but making use of scenario techniques to envisage favoured and adverse outcomes under different perspectives and circumstances, with an emphasis on the construction of a consensual vision of a desirable outcome of course of action.

Focus Groups	Typically involves less than 20 individuals, usually deliberately selected on the basis of finely formulated demographic or other criteria. Structured discussion of a bounded topic by a small group of selected individuals under the moderation of a trained facilitator with full transcripts recorded and analysed and conclusions drawn by specialists.
Deliberative pools	Typically involves less than 20 individuals, usually selected on the basis of a random process, stratified to account for basic demographic factors. The eliciting of opinions by systematic questionnaire protocols augmented by some form of interactive process, with sampling often performed before and after deliberation.
Strategic Niche Management	Involves a variable number of different social actors with a manifest interest in the configuration of an emerging technology or technological system. Iterative and reflexive interactions, appropriately "modulated". Take place in a variety of ways and over a protracted period of development of the technology in question in a protected niche market.

Table 1. Examples of TA methodologies. Source: Assouline, Joly, 2001, p.16 (from Stirling, 1999)

2.5.4 Technology Assessment and Participation

As we can see from the table, all models of Technology Assessment aim to involve various social actors into the assessment process. They advocate the idea that technology development cannot be analysed abstractly, it must be considered within a particular context and as a part of the social system. This is in turn derived from the observation that numerous political and public controversies over technologies could be settled by reaching a consensus on issues such as the definition of technology and its risks. “Divergent voices in many public controversies…simply could not – or cannot – be forced into a single definitional mould in the name of the official expert’s facts and their rationality” (Schwartz, 1992, p.36). Unlike Technology Assessment conducted solely by scientists, Technology Assessment with public participation could be better equipped for identifying various issues, broadening scopes of debates, and providing valuable inputs and contributions.

The wide range of participants being the main characteristic of the presented methods, the key issue that now emerges is the way in which the participants are selected.

Bellucci et al.(2000) offer two main principles: "representativity – i.e. that participants should reflect the relative weight of interests, views, arguments and groups in society – versus "balance" – i.e. the attempt to involve people from all "relevant" groups (arguments, viewpoints, interests and other background variables) regardless of their relative strength in society" (p.39). There are different methods of selecting participants. For instance, for a consensus conference 15-20 people are selected as panellists. In order to participate, lay people need to react to an advertisement published in newspapers and the 15-20 are selected. Selection criteria are usually adapted to a political context. Such a method is often criticised for the fact that such a limited number of people cannot represent the entire population. Despite the fact that consensus conferences are meant to facilitate an exchange of ideas, views and values between scientists, stakeholders and lay people, it is argued "that stakeholders and experts act as information sources and transmitters within this method, whereas lay people are merely positioned as information receivers"(Ibid, p. 125). The clear risk of falling into the Callon's Model of Public Instruction is present, in which case it could utterly defy the initial reasons for organising such conferences.

2.5.5 Technology Assessment in Institutional Context

As underlined by Bellucci et al. (2000), structures and procedures of TA institutions, as well as available financial and human resources, can all influence meanings, structures, performances and outcomes of TA arrangements. More specifically, the choice of a TA arrangement, the criteria it must fulfil, as well as the legitimacy of the results are dependent on a number of factors:

- *the wider institutional context, formal and informal, dependencies and relationships to academia, parliament and social groups;*
- *the history of the institution and the related process of trust-building (does the institution have a straight history or is it erratic in its conduct, is the organising institution ad hoc or is it a long standing organisation;*
- *the formal brief and the informal connotations of the brief (e.g. does the formal brief hint at / demand participation, does this brief specify the type of participation of e.g. social groups, wider public);*
- *the issue related institutional context, e.g. the discourse coalitions around a certain issue and the role of the TA institutions amidst it. Institutional analysis should take into account the context in which the institution*

> *operates in the sense of institutional dependencies of a TA organisation, embedded in a larger framework of a political regime* (Bellucci et al., 2000, p.33-34)

Following Laura Cruz Castro and Luis Sanz Menendez (2003), the two models of TA could be distinguished in terms of their relationship with Parliament and, as a result, their degree of autonomy: instrumental and discursive.

- The instrumental model includes the TA arrangements "…whose chief (or only) customer are the respective Parliaments or their Committees" (p.13). This group consists of Parliamentary Offices of Technology Assessment in Germany (TAB), France (OPECT), UK (POST), Flanders (viWTA) and the European Union (STOA). As underlined by Cruz Castro and Sanz Menedez, this type of TA, despite its recognised autonomy, depends on " …the 'authority' of the legislators" which may result in the limiting of TA's autonomy. This could take the form of the selection of objects for analysis or even the way in which a particular TA office operates. (Ibid, p.17).

- The second model "…applies to the countries [Denmark (DBT), The Nerthelands (Rathenau), Switzerland (TA Swiss)] that have a long-standing civic tradition and have asked the TA institutes not only to contribute to "enlighten" parliamentarians' (and even the government's) decision-making processes, but also to help their respective societies to foster a social debate about the acceptability of technologies" (Ibid, p.13). The customers of this type of organisation are not limited to Parliaments, which allows for a greater degree of independence and autonomy. However, at the same time it also allows them "to manoeuvre socially in order to further the proposed objectives directly" (Ibid, p.17).

Therefore, the outcome of TA often depends on the degree of dependency on, for instance, political institutions, credibility and legitimacy of TA arrangements, the amount of financial and human resources available, time, and the imposition of restrictions on the choice of subject and the problem setting or definition. As demonstrated by Levidow (1999), problem definition or the way in which risk is framed is a crucial factor in TA and may greatly influence the process and the outcome of TA. He reveals that despite a wide range of actors participating in TA, the boundaries can be set on broadening the definition of risks beyond a scientific one, and as a result, the wider debate can be narrowed or closed[4].

2.5.6 Technology Assessment and Decision-Making

Furthermore, Bellucci et al. (2000, p.34) state that participation in TA may have different meanings: it could be used as "a consultative instrument in support of the representative decision-making mechanisms", as a means "of disseminating information from scientific institutions to both politics and the general public" and it could be "giving the public at large a constitutional role in assessing science and technology."

Consequently, in many cases there is no strong relationship between TA and the political decision-making process. It very much depends on politicians as to whether or not they attach any importance to the results of the TA. "Whether the outcome of a PTA [Participatory Technology Assessment] is taken seriously by the political system depends on the history of that method within a certain political culture and the attitude toward that particular method" (Ibid, p. 123)

2.6 Summary

To conclude, the apparent limitations of old traditional models of governance have triggered debates and a search for better solutions. Public participation in Technology Assessment has recently been widely advocated. Wide participation enables the identification of new issues, values and views and the broadening of the discussion. Nevertheless, there are still various difficulties which must be overcome for the successful practical implementation of TA. The possible dependency on political institutions, financial factors, as well as the choice of the method and participants are crucial but problem-posing factors. The legitimacy and credibility of TA as well as its relationship to democratic procedures relies greatly on who presents technology and how, as well as its problems and risks. In technocratic regimes and expert-based

[4] The author uses the example of UK advisory committee on GMO. Despite wide participation the committee accepts the government definition of risk and as a result imposes the restriction on enviromentalists participating in the committee. For details see: L. Levidow (1999). "Democratizing Technology – or Technologizing Democracy? Regulating Agricultural Biotechnology in Europe."

forms of assessment, the definition of technology and risks are reduced to a scientific one and as a result, makes it impossible to conduct a truly open debate. However, although broad participation is intended to overcome this problem, it is often used as a legitimising tool. Problems are still framed, impeding a balanced discussion, and the policy makers could ignore the outcomes of the assessment.

3 RADIO FREQUENCY IDENTIFICATION TECHNOLOGY

Abstract

Having presented the theoretical concepts which will enable the investigation of the empirical material, the technology, history, functions and applications of RFID will be presented in the following chapter. Whilst I appreciate that RFID is a social construct, I will adopt a factual and descriptive approach to RFID as a technological artefact. The information which will be presented aims to explain this technology to the reader.

3.1 Introduction to RFID

As a case study, Radio Frequency Identification Technology (RFID) will be used. On the one hand, RFID is not a new technology and it is being actively deployed in numerous areas such as access control, transport and logistics, supply chain management, real time location, and many others, but on the other hand, it is still an emerging technology, with research and development still in progress. Engineers and policy makers see this technology as the technology of the future, as the technology which will break down "…the boundary of the cyberspace and real space" (V. Reading, 2006). However, despite the fact that this technology has been deployed for a long time and "cumulative sales of RFID tags have totalled 2.4 billion over the past 60 years", there has so far been scarcely any debate amongst stakeholders about the ethical, legal, cultural, and social issues related to this technology (www.europa.eu.int). Only in March 2006, the European Commission launched a public debate on the opportunities and challenges of RFID technology. The debate is initiated with the intention of adressing various aspects of RFID such as "…privacy, security, technological reliability and international compatibility. [As well as a]…key challenge for decision-makers… to devise a common vision and set of goals of how RFID can keep Europe more innovative and competitive in the world economy while at the same time giving citizens the tools and choices they need to ensure privacy and security."(Ibid.) However, despite its widespread deployment, to many people RFID technology is still unknown. According to a survey conducted by Capgemini, Ernst & Young, 77% of the population in the US and 82% in Europe have never heard about this technology. (Capgemini, 2004). Moreover, for governments, the potential benefits and implications of RFID remain unclear, and the debate surrounding the policy is open.

Nevertheless, RFID has recently received substantial attention as an augmentation technology in the field of ubiquitous computing[5]. Both the utopian vision of the future, in which technological advancement is given an empowering and ruling role, and the dystopian one, in which technologies cause the failure or termination of civilization, have been presented by the media in the context of RFID technology. A well-known forecast by Mark Weiser, anticipating that "…ubiquitous computers will help overcome the problem of information overload [and]...will make using a computer as refreshing as taking a walk in the woods" presents a happy and joyful future (Weiser, 1991). By contrast, RFID technology has triggered the fear of the emergence of an Orwellian Big Brother society (G. Orwell, 1948). The privacy concerns emphasised by journalists, consumers, and consumer privacy advocates groups such as Consumers Against Supermarket Privacy Invasion and Numbering (CASPIAN) underline the necessity to recognise the negative implications of RFID technology. The privacy concerns related to RFID have been widely acknowledged by various stakeholders. However, the debate does not reach beyond technical consequences of collecting and storing data. Issues such as impact on health and environment (J. Bohn et al, 2005), as well as ethical issues and the social meaning of RFID technology, have not been addressed by policy makers.

3.2 RFID explained

In the following chapter, the history and description of the RFID system will be illustrated. As the objective of this thesis is not to provide a history of RFID, only a brief overview will be presented with the intention of facilitating an understanding of the RFID debate presented in the next chapter, as well as to provide the reader with an overview of the development of this technology. The historical outline also aims to demonstrate that the debates about RFID regulation and governance are coming very late considering the fact that this technology has been used and applied for many

[5] For more information see http://www.vs.inf.ethz.ch/res/ "What are key technologies for ubiquitous computing?" ; ITU (2005) *"Privacy and Ubiquitous Network Societies"*; Floerkemeier C. & Lampe M. (2005) *"Issues with RFID usage in ubiquitous computing applications."*

years. A comprehension of the technology is important in order to understand its applications, as well as its implications.

3.2.1 History of RFID

As with many technologies, and particularly with information technology, their purpose and predicted applications often differ from their usage and consequences. As underlined by R. Sclove (1999) " …technologies [are] more than mere tools for accomplishing narrowly defined objectives. Technologies also represent an important species of social structure"(p. 18). Initially, RFID technology was developed for military application. However over the years, the scope of the application widened, but with this technology still being developed, it is important to underline that it is possible that its applications and effects could vary from those currently predicted.

Contrary to popular opinion, RFID is not a new technology. As described by Juban and Wyld (2004), radio object detection was first patented in 1926 and was seen as an important military application. The exploration of RFID techniques followed technical developments in radio and radar (Landt, 2001). Table 1 illustrates the timeline of RFID technology development (Ibid, p.7). The radar emits radio waves for detecting and locating an object by the reflection of these waves. This reflection facilitated the determination of the position and speed of aircraft. These technologies were used for tracking purposes during the Second World War. The United Kingdom used such devices to distinguish their planes from those of their enemies. The British desired the ability to differentiate between their own returning aircraft and those of the enemy in view of the fact that the coast of occupied France was less than 25 miles away. A transponder was placed on Allied aircraft so that by giving the appropriate response to an interrogating signal, a "friendly" aircraft could automatically be distinguished from one of the enemy. The importance of radar development was quickly acknowledged by the military, and for many years the research was conducted in secrecy. H. Stockman's October 1948 paper, "Communication by Means of Reflected Power" in The Proceedings of the IRE (Institute of Radio Engineers) first discribed the theory and implementation of RFID. In that paper Stokman stated that "evidently, considerable research and development work has to be done before the remaining basic problems in reflected-power communication are solved, and before the field of useful applications is explored." During the 1950s and 60s, several technologies related to RFID such as the long-range transponder systems of “identification, friend or foe” for aircraft were being explored (Ibid, p.4).

Commercial applications started in the 1960s, when electronic article surveillance equipment to counter theft was developed. During the 1970s various developers, academic institutions, and government laboratories were all working on RFID technology. Intended applications were animal tracking, vehicle tracking and factory automation (Ibid, p.5).

During the 1980s, RFID was implemented in various domains in both the USA and in Europe. Toll roads in France, Norway, Portugal, Spain and Italy were equipped with RFID. In the US, tags were used to enable personnel access. In the 1990s, these developments continued and RFID technology started to be widely deployed all over the world.

Decade	**Event**
1940-1950	Radar refined and used, major World War II development effort. RFID invented in 1948.
1950-1960	Early exploration ns of RFID technology, laboratory experiments.
1960-1970	Development of the theory of RFID. Start of applications field trials.
1970-1980	Explosion of RFID development. Tests of RFID accelerate. Very early adopter implementations of RFID.
1980-1990	Commercial applications of RFID enter mainstream.
1990-present	Emergence of standards. RFID widely deployed. RFID becomes a part of everyday life.

Table 2. History of RFID**.** Source: Ibid, p.7

As demonstrated, RFID is not a new technology. Although it is already extensively deployed, wider adaptation is still expected to come: “The number of tags delivered in 2016 could be over 450 times the number delivered in 2006.” (www.europa.eu.int, 2006). Arguably, one of the main reasons for utilizing this technology in sectors other than the military is the vast reduction in the prices and size of RFID tags. According to Business Week (2004) the tag price is already only 25 cents. However, it is expected to be reduced to 5 cents in future. Sales of RFID tags are also anticipated to increase dramatically in the next few years, reaching around $4.6 billion in 2007 (estimates by Wall Street research firm Robert W. Baird & Co) (BusinessWeek, 2004).

Having outlined the historical development of RFID, the way in which this technology works as well as the areas of its application will be presented.

3.2.2 RFID System[6]

RFID is a method of identifying objects by enabling a unique characteristic of the object to be transmitted and read using radio waves. (Wipro, 2004). A basic RFID system consists of four elements: a chip, an antenna, a transceiver (reader) and a database where information about tagged objects is stored.

1. The chip, usually made of silicon, contains information about the tagged objects such as, for example, a unique identifying number stored on it.
2. The antenna transmits the information from the chip to the reader using radio waves. The larger the antenna is, the longer the read range. The chip and antenna are known as a transponder or a tag. A transponder can vary in both shape and size. Inserted beneath the skin, they can be as small in diameter as a pencil lead, or as big as 13x10x5 centimetres rectangular transponders, which are used to track trucks.
3. The reader uses its own antenna to communicate with a transponder using radio waves operating at a certain frequency. It could be mobile or stationary. The reader decodes the data encoded in the tag's silicon chip and passes it to the computer for processing. Readers are capable of processing multiple items at once.
4. The database stores the information about RFID-tagged objects.

[6] The illustration of RFID system and its technical characteristics could be found in Appendix 1.

3.2.2.1 Features

RFID tags are categorised as active, passive, or semi-passive.

- ***Active tags*** can initiate communication and are powered by an internal power source. Its memory size varies according to its application, and could be as large as 1MB. The battery-supplied power of an active tag provides it with a longer read range. They can communicate over 30 metres or more. However, such tags are generally greater in size, more expensive (20 dollars or more), and have a limited operational life.

- ***Passive tags*** function without a separate external battery and obtain power generated from the reader. Passive tags are smaller and lighter than active tags, and are less expensive. They cost between 20 cents and several dollars and have an unlimited operational lifetime. Nevertheless, they have shorter read ranges than active tags. Theoretically they can be read from up to 10 metres away, however, in a real world environment the range reduces to around 3 metres. Passive tags are already used for building access cards, the tracking of consumer products, etc.

- ***Semi-passive*** tags are powered by internal battery but they do not initiate communication with the reader. The power is used to store the information on the chip (e.g. temperature). Their cost is about 100 dollars, but the price is expected to fall to less than 10 cents.

- ***"Read/Write capacity" or "Read-only" capacity***. Writable tags can receive and store additional information, whereas read-only tags hold information which cannot be altered. Passive tags are typically read-only and are programmed with a unique set of data that cannot be modified. Active tags are generally read/write tags, data on which can be rewritten and/or modified. (Aimglobal)

- ***Frequency.*** RFID systems are also differentiated by their frequency ranges. Every RFID tag is produced to work on a specific frequency. The most common frequencies used by RFID systems are low (around 125 KHz), high (13.56 MHz) and ultra-high frequency, also called UHF (850-900 MHz). Some applications also use Microwave (2.45 GHz) frequency (RFID Journal, 2004). However, in the UHF frequency range, two different approaches have been followed in Europe and North America. In North America, a wide allocation from 902-928MHz can be used on an unlicensed basis. In Europe the 865 MHz to 868 MHz band with power limits up to 2 Watts was allocated for RFID by the European Telecommunication Standards Institute (ETSI). However, in many European countries the regulations have not yet been implemented due to incompatibility with existing radio systems. (OECD, 2005) At present, the European Commission "…is considering the need to apply its regulatory powers to ensure that all 25 countries implement this regulation without further delay" (www.europa.eu.int). The lack of international frequency standards is one of the major obstacles in the development and implementation of RFID technology.

3.2.3 Applications of RFID

RFID technology is used in a broad range of applications. As stated on the 'rfidxchange' website "RFID Applications are limited only by imagination!" A variety of sectors is already deploying or planning to deploy RFID technology. In this section only a few of the possible applications of RFID will be described in order to demonstrate a variety of the functions of RFID technology across different sectors.

– ***Inventory management***. RFID tags have already been extensively used to track inventory. The use of RFID technology in inventory tracking increases the visibility of inventory, thus reducing the frequency of shipping errors and of theft, and their associated costs. Wal-Mart has instructed its top one hundred suppliers that from January 2005 it should be able to read RFID tags from cases and pallets shipped by those suppliers to its three US distribution centres (Weinberg, 2004, p.4). Moreover, RFID systems are already utilised or planned for installation at more than 300 libraries in the United States, as well as libraries in Europe and even the Vatican. Whilst tagging 600,000 items, the library systems of the University of Nevada saved $40,000 by finding more than 500 lost items in its collection. (Gilbert, 2004)

– ***Transportation.*** Michelin has started testing RFID tags used for passenger and light trucks tyres. Each tyre's identification number is connected with the Vehicle Identification Number in an external database which contains information on where and when the tyre was made, its size, maximum inflation pressure, an so on (Weinberg, 2004, p.5).

– ***Retail Applications***. Several major retailers such as Carrefour, Home Depot, Marks & Spencer, Metro AG, Tesco and Wal-Mart, as well as their suppliers including Gillette and Procter & Gamble have already undertaken trials and introduced RFID tags in their products and shops. The RFID tag is placed on individual consumer items. Tesco, the largest retailer in the United Kingdom, started placing RFID tags on the packaging of non-food items at its distribution centres to track them through to the stores in April 2004. (RFID Journal, 2004).

– ***Government Applications***. Within the United States Federal government, various departments have initiated programs to evaluate using RFID chips for specific purposes. Table 2 lists the departments and their initiatives.

Agency	**Application**
Department of Defence	Logistics support and material tracking
Department of Health and Human Services	Drug authentication, chip implants
General Services Administration	Asset management and transportation
Department of Transportation	Freight and mass transport
Department of Homeland Security	Immigration, border control, and customs (US-VISIT), search and rescue, and disaster response
Department of Veterans Administration	Patient and supply chain tracking
Department of the Treasury	Records management
U.S. Postal Service	Mail security and tracking
National Aeronautics and Space Administration	Hazardous materials management
Department of State	E-Passports
Department of the Interior	Access cards
U.S. Department of Agriculture	Animal tracking for disease control

Table 3. U.S. Government RFID Application (Source: Department of Commerce, 2005)

- ***Healthcare.*** RFID tags are used in the pharmaceutical industry to track medicines in order to combat counterfeiting and theft. RFID systems were also deployed in Singapore hospitals during the outbreak of Severe Acute Respiratory Syndrome, or SARS. They were used track the movement of staff, visitors, and patients so that all of the people with whom a suspected SARS patient had come into contact could be traced (RFID Journal, 2003).

- ***Implantable RFID chips.*** Implanted RFID tags are used for tracking animals and linking the animal to food and location. However, implanting RFID chips in human bodies is only stating to develop. In October 2004, the U.S. Food and Drug Administration approved the use of RFID tags implanted in humans for medical purposes. By linking the number stored on the chip with a database, the medical staff would be able to read medical information about blood type, drug histories, and other critical data stored in computers (Feder & Zeller, 2004)

  Besides medical applications, the RFID chips are being used for different purposes. The VIP members of Baja Beach club in Spain and the Netherlands can be injected with the tag into their upper arms which will allow them to access the VIP lounges and use the RFID tag like a debit card to pay for drinks (www.bajabeach.es). In July 2004, Mexican Attorney General Rafael Macedo de la Concha, his staff, and around 160 employees of an anticrime computer centre in Mexico City were implanted with RFID tags in order to be able to securely access their buildings.

In 2005 the European Group on Ethics in Science and New Technologies to The European Commission (EGE) published the Opinion "Ethical aspects of ICT implants in the Human Body". In this opinion, ethical principles such as human dignity, human inviolability, equity, privacy and surveillance were considered in the context of medical and non-medical applications of implantable chips. The EGE pointed out that this technology "raises societal fears as well as hopes. (EGE, 2005, p.36). As a result, the EGE underlined the need for broad social and political debate in order to establish which kind of applications should be accepted and legally approved. Furthermore, at present non-medical applications are not covered by existing legislation and consequently, the opinion that "this field needs regulation" was expressed (Ibid, p.35).

3.3 Summary

By way of summary, RFID technology has been developed since the beginning of the twentieth century, starting as a military application, and gradually being introduced for civilian purposes. Nowadays, RFID tags are already being used in a great variety of sectors, and a large number of projects and tests are underway concerning possible future applications of RFID chips. However, the RFID system remains relatively unheard of by the vast majority of our population., despite widespread deployment. As stated by T. Cole (2006) "…businesses have been introducing RFID systems "through the back door"(from Sayer, 2006). Nevertheless, public awareness and concerns surrounding the technology are gradually growing. Privacy advocates groups such as CASPIAN not only raise this awareness, but also organise numerous protests against the use of RFID tags. Campaigns calling for boycotts against Tesco, Benetton, Gillette or other companies introducing RFID chips have already taken place.

4 RFID REPORTS

Abstract

Having presented RFID technology, in the next chapter three reports will be discussed, preceded by the presentation of the analytical tool. These reports are: "Security Aspects and Prospective Applications of RFID Systems" issued by the German Federal Office for Information Security, "RFID Radio Frequency Identification: Applications and Implications For Consumers" report from the American Federal Trade Commission, and "Radio Frequency Identification" report issued by the British Parliamentary Office of Science and Technology.

4.1 Introduction

"In recent years the assessment of risks stemming from technological development has gained a lot of attention. This is due to the fact of increasing awareness of the negative side effects of technological growth…" (O. Brekke, E. Eriksen , 1999, p.93).

As highlighted by Misa et al (1995), technological impacts must be considered during the development of the technology. Various stakeholders including users and other impacted communities should be involved in a technology assessment process. In the following chapter three cases of RFID technology reports will be examined. The reports issued by the German Federal Office for Information Security, by the Parliamentary Office of Science and Technology in the United Kingdom, and the Federal Trade Commission in the United States of America will be analysed and evaluated. These countries have been chosen because Germany and Great Britain remain the leading European countries in the application of RFID technology.

> "*In terms of RFID applications the United Kingdom (UK) and Germany lead the way. Germany has the extremely high profile of METRO Group initiative which has already started rolling out RFID within its suppliers base. Tesco in the UK has also announced a roll out plan with its suppliers, and Marks & Spencer has conducted trials both at pallet and item level within a number of stores. Also in the UK, the Home Office, which looks after internal affairs, conducted a series of experiments utilising RFID as part of its Chipping of Goods initiative aimed at reducing shrinkage in the supply chain.*" (Juniper Research, 2005).

However, the application of RFID tags in the USA extends beyond commercial use. “Thirteen out of 24 CFO [Chief Financial Officer] Act agencies reported having implemented or having a specific plan to implement the technology in one or more applications” (GAO, 2005, p.2).

Moreover, this technology could be a good example for the analysis of the process of technology governance because despite the fact that it has already existed for years, only now does it appear on the political agenda; the focus on RFID tags is very new. However, it should be underlined that in spite of the fact that RFID technology has been present for many years and that RFID is seen as a revolutionary and significant technology, the number of reports concerning it is still very limited. Despite the very limited number of reports, the careful and detailed evaluation of the three main reports should provide an ample source for analysis.

4.2 Analytical Tool

As a tool to analyse the report, three different approaches to the assessment of technology will be used, as presented by O. Brekke, E. Eriksen (1999) in their article “Technology assessment in a deliberative perspective”. By analysing various methods of assessing technology, they demonstrated how well particular institutional arrangements are equipped to deal with issues raised by technological developments. In order to create the classifications, Brekke and Eriksen analysed the structure of emerging technology assessments institutions, the types of problems which they address, the manner in which these problems are managed, and to what extent different institutional procedures act in accordance with normative standards. As underlined in the previous chapter, Cruz Castro and Sanz Menedez pointed out that there is a direct link between TA institutional settings and autonomy, outcome, and credibility of the TA process. Brekke and Eriksen offer three different types of arrangements which will facilitate the understanding and analysis of RFID technology assessment in three reports. Furthermore, bearing in mind the Callon’s Technological democracy typology and Joly’s Models of Innovation and Risk governance, Brekke and Eriksen’s approaches will assist the evaluation of the relationship between the experts and lay people.

Three main types of institutions representing different approaches to technology assessment were distinguished, with respective views on what validates such assessment.

Theses institutions are:

- Independent expert arrangements.
- Corporative or interest-representative arrangements.
- Participatory arrangements.

Independent expert arrangements. For many years the notions of risk and the competence of experts have been strongly connected: scientists, who were asked for advice by politicians, were assessing risk and developing solutions based on empirical data and technical insight. As a consequence, the evaluation of risk "was understood as a cognitive undertaking, oriented towards determining the facts of the matter" (O. Brekke, E. Eriksen , 1999, p.96). This type of assessment is considered to provide an objective and valid picture of reality and its goal is to deliver a solution to particular problems. The main assumption of this arrangement is that the risk and benefits of the deployment of a particular technology, as well as the consequences of its deployment, can be measured by the means of scientific data. Defined in such a way, the politicians delegate authority to scientists who provide a factual foundation recommendation for decision-making on a complicated issue. In this way, science unburdens policy makers from intricate normative debates. Whereas, by equipping themselves with a legitimate basis for decision-making, politicians ensure public trust.

However, purely scientific assessment based solely on technical evaluation reduces problems to merely scientific facets, with social, moral, and physical, etc. aspects left neglected and under-communicated. "Transforming societal risk questions into scientific questions represents an inappropriate translation of the issues involved as they are translated into a discourse on truth" (Schomberg, 1993, p.17).

Corporative or interest-representative arrangements. In many instances, the problem solving capacity of scientific experts is not sufficient to assess risks. The inclusion of interest representation is required when the assessment of risks comprises various interests and social conflicts. This type of assessment is based on the assumption that by collaborating with organised interests, scientific experts and government representatives can reach decisions on behalf of society. Corporative representation involves the process of negotiation or bargaining over the conflicting interests and preferences, with the conflict being resolved by reaching a compromise. Thus, such arrangements are appropriate only for questions "…where one can find points of balance, equilibria, compromises and trade-offs. This require that the issues involved can be measured by the same standards" (O. Brekke, E. Eriksen , 1999, p.99). Such arrangements are well suited for instances in which conflicting representatives do not have strong preferences regarding the outcome, and are ready to compromise. Nevertheless, it seems difficult to comprehend how it could be possible to compromise on the acceptability level of certain risks. In numerous cases, it is a question of all or nothing.

Moreover, due to the increased speed of technological development, the amplified number of unknown consequences, and risks defying immediate experience, the corporative solution becomes insufficient. The complexity of the problems requires a re-establishment of the processes of risk assessment and decision-making.

Participatory arrangements. Participatory arrangements represent new and alternative type of institutional arrangements. They entail involving laymen into a decision-making process, which could be approached in a number of different ways: organising public hearings, consensus conferences, deliberative opinion polls and many others.

The main reason for involving lay participation in risk assessment is to reinforce the democratic element of the assessment. Lay public participation can add to the number of aspects considered during the assessment process, broaden the scope of issues which are, or should be taken into account, and as a result improves problem-solving ability. Moreover, it may increase the legitimacy of decision-making.

However, there is a wide range of drawbacks which participatory arrangements are criticised for.

Firstly, they have a tendency to oversimplify complex issues. This is derived from the necessity to frame the issue in an either/or fashion in order to make public participation possible. Consequently, neither the discovery of risks nor the definitions of problems occur, and only the solution to a given problem is provided. Certainly, such framings do not always take place. However, a different type of framing is also possible, where reducing rather than increasing the range of problems takes place. The organisers can lead the process in a specific direction through the choice of the problem, enrolment of lay people and experts, and the organisation of the proceedings.

Secondly, advocating participatory approaches carries a risk of substituting faith in science with an absolute faith in the people and of radically shifting the focus from science and expertise. Without any doubt, certain questions should and could be answered only by scientific experts.

Thirdly, participation itself does not guarantee reaching accurate decisions, which from the very beginning could be based on wrong questions or biased discussions.

Finally, such arrangements are criticised for perceiving society as "a some sort of static entity" (Ibid, p. 103). The distinction between experts and lay people often rests on the assumption that lay participants will have a single public opinion, value or perspective. In this way, the participatory arrangements could be organised in order to legitimise certain options or decisions which had already been made.

4.2.1 Criteria of analysis

O. Brekke and E. Eriksen concentrate on aspects of technological assessment such as assessment representatives, its purpose, rationality underlying the methods of assessments, and relation to political regime in order to illuminate how particular institutional arrangements engender technological decision-making. Theses categories are vital for my analysis of the reports; however, I will expand the scope of the analysis beyond these aspects and will examine how technology itself is presented in the reports, how the evaluated issues are framed, as well as the role given to society and government.

Consequently, while describing the reports I intend to analyse and present them according to the following criteria: firstly, *the composition of representatives* will be presented and analysed. As all of the reports are intended to inform the policy makers on various aspects of RFID technology and as a result may influence the policy, it is important to identify the actors engaged in the process of the report production. In this part, the questions as to who are the actors, and why they are involved will be answered. In the next section, *purpose of the report*, the aims and objectives of the reports as well as their structures will be presented. The following part will be dedicated to *RFID Technology* vision. The manner in which RFID technology, as well as its risks and benefits are defined, is likely to influence the policy on RFID technology. The technology definition will allow us to analyse the intentions of the actors involved, as well as to understand and investigate their outcomes and conclusions, which in turn can be influenced by factors such as actors' backgrounds, expertise, and interests. Next, *the role of society* will be evaluated. According to the STS approach, science, technology and society are interconnected. In many instances, a variety of technical possibilities are available, but the selected possibility cannot be reduced to simple technical factors, and is instead shaped by a wide range of social factors. Nevertheless, there are perspectives such as Technological or Social Determinism, which position society in relation to science and technology differently. In this part, I will present and analyse how the authors of the reports view society in relation to the development of RFID technology. Subsequently, *the role of governance*, state and regulation, as well as policy-makers' visions of RFID technology and its developments will be discussed. After each report a summary in the form of a table will be presented.

4.3 SECURITY ASPECTS AND PROSPECTIVE APPLICATION OF RFID SYSTEMS

Federal Office for Information Security. Germany

Background

The study on "Security Aspects and Prospective Applications of RFID Systems" was conducted by *the German Federal Office for Information Security* (BSI) in cooperation with *the German Institute for Futures Studies and Technology Assessment* (IZT) and *the Swiss Federal Laboratories for Materials Testing and Research* (EMPA) in 2004.

As stated on the BSI website, the Federal Office is "the central IT security service provider for the German government" (Helmbrecht), whereas the IZT, *Institute for Futures Studies and Technology Assessment*, is an independent and non-profit research institute with their main mission being to conduct interdisciplinary foresight studies with a long term impact on society (IZT, 2006). The main task of the third participant, *Swiss Federal Laboratories for Materials Testing and Research*, are "…innovative collaboration with industry and public institutions, ensuring the safety of people and the environment, knowledge propagation and university-level teaching" (EMPA, 2006).

One might argue that due to the fact that the study was conducted by *the German Federal Office for Information Security*, which is presumed to provide technical solutions to technical problems, this report is expected to concentrate exclusively on the technical aspects of RFID technology. However, it should be underlined that an institution such as *the Institute for Futures Studies and Technology Assessment* is the co-author of the study, that it was the only project related to RFID technology carried out by this institution, and that the results (meaning this particular report) could be found on the IZT website in both German and English languages.

Composition of representatives

Considering the broad range of functions and missions of these very different institutions, one might expect that the study performed would demonstrate a truly interdisciplinary approach to the assessment of RFID technology. Nevertheless, from the very first pages of the 120-page long report, on which the methodology and the participants are presented, it becomes clear that this is not the case.

Apart from the institutions mentioned above, a number of experts were participating in this study. All experts, though representing different universities and research institutions, come from scientific or technological institutions and have scientific or technical backgrounds. Among the consulted experts were K. Finkenzeller, the author of "RFID handbook: fundamentals and applications in contactless smart cards and identification", which provides a detailed technical description of RFID technology; C. Floerkemeier from *the Institute for Pervasive Computing* in Zurich, representatives of Kaiserslautern University, Freiburg University and many others.[7]

Study structure

The study was based on a combination of qualitative and quantitative techniques. In the initial stage, the experts studied and analysed literature and documents available on the subject of RFID technology. Interviews with experts from universities, research institutions, and companies were subsequently conducted, followed by an online survey. The survey was conducted in August of 2004. Organisers contacted a total of 160 companies and research institutions by e-mail, all of them having had practical experience in the field of RFID. Responses were collected from 70 of these companies, including system integrators, manufactures of readers, manufacturers of transponders, users, hardware providers, etc. The survey and interviews were conducted with the intention of establishing factors promoting and discouraging the use of RFID.

Purpose of the report

As stated in the report on page 22, the purpose of the study was:

[7] The full list of experts is presented in appendix 3.

- To provide a record of the current technological development in RFID systems;
- To highlight the application areas and possibilities of this technology;
- To assess effects in the area of IT security;
- To present opportunities and risks related to the use of RFID systems.

The study was conducted with the objective of raising the awareness of decision-makers on the real possibilities and risks in the area of RFID technology, to compel them to analyse information technology systems appropriately and proactively, and to protect the system in a suitable manner. Above all, the initiators of the study aimed to increase people's awareness in the topic of information security of RFID systems.

RFID Technology

RFID technology is presented in this study as a revolutionary technology, which is affecting or will affect all areas of our lives. "We think it is appropriate to speak of a revolutionary perspective on technology" (p.10). The most substantial part of the report details the analyses of current and future applications of RFID systems, as well as the potential dangers and risks. Although the need for early recognition of risks (including social and ecological) is highlighted, the leading role in this respect is attributed to scientists: "…it becomes one of the most important tasks for scientists to discover as early as possible the opportunities, problems and risks" (p.10). Even though one of the main aims of the study was to identify the potential risks of RFID systems, the risks which are being considered and highlighted in this study are narrowed down to data security and privacy issues. A wide range of potential threats to privacy and technical countermeasures to these threats are also presented.

Role of society

The role given to society in this report is rather limited. Despite the acknowledged increasing number of doubtful voices, considerable uncertainty among consumers and an underlined need for transparency in the discussion of RFID, the function attributed to society is to accept or reject this technology. Moreover, social acceptance of RFID technology is rather expected due to the fact that there are already "products that enjoy social acceptance and demand (loyalty cards, RFID-based ski passes).

Apparently the utility that consumers get in such cases is more important than is the fear of intrusions into one's private life". (p.103)

Role of governance

As stated in the report, one of the main purposes of the study was to make policy-makers aware of the benefits and dangers of RFID technology, and to prompt them to protect the system. Thus, the report is intended to promote the technology and encourage its development, as there is no great potential danger. Consequently, no proposals or suggestions for policy makers to regulate RFID technology are made. As a result, "German Government "sees no need to regulate at present" " (H. Poganatz, 2005, p.10).

Summary

Composition of representatives	**Government**: German Federal Office for Information Security **Non-governmental organisations:** German Institute for Futures Studies and Technology Assessment, Swiss Federal Laboratories for Materials Testing and Research **Academia:** Institute for Pervasive Computing in Zurich, Kaiserslautern University, Freiburg University
Purpose of the report	• To increase awareness of decision-makers on the possibilities and risks in the area of RFID technology; • To provide a record of the current technological development in RFID systems; • To highlight the application areas and possibilities of this technology; • To assess effects in the area of IT security; • To present opportunities and risks related to the use of RFID systems.
RFID Technology	RFID technology is presented as revolutionary technology. The major risks are threats to data security and privacy.
Role of society	Society is prented as a user, that can accept or reject new technology.
Role of governance	No suggestions for policy makers to regulate RFID technology are made.

Table 4 Security Aspects and Prospective Applications of RFID Systems

4.3.1 Critical Perspective

As outlined in part 4.3, the main organiser of the study "Security Aspects and Prospective Applications of RFID Systems" and the author of the report was *the German Federal Office for Information Security*. Whilst a great number of experts have participated in this project, after careful analysis of the participants' background, it becomes apparent that all of the experts have scientific or engineering backgrounds. Such composition of representatives according to Brekke & Erikson is present exclusively in the Independent expert arrangements**.** Consequently, such arrangements result in reducing problems and risks to a scientific perspective and they are aimed at delivering solutions to particular problems. Whether such reduction occurred during the "Security Aspects and Prospective Applications of RFID Systems" study will be analysed in the next paragraphs of this chapter.

In the "Security Aspects and Prospective Applications of RFID Systems" study, RFID technology is presented as being outside of the social context. The technical aspects of this technological system are being separated from social aspects. RFID technology is presented as developing independently and all problems appearing during this process should be, and are solved by scientists, who develop technical solutions to any kind of problem. The potential risks are defined exclusively from the scientific point of view and, as a result, numerous countermeasures, such as *Use of blocker tags, Permanent deactivation, Kill command, Field-Induced Deactivation* are the proposed solutions to the privacy and data security risks. Reducing the problems to scientific ones and a search for the scientific solutions to resolve them are the prime characteristic of technocratic, technology deterministic approach and falls into the Standard model of innovation and risk governance by P. B. Joly. As both Callon and Joly pointed out, problems defined in such a way leave no space for any kind of a debate. Such "objectives" risks formulated by experts oppose the "perceived" risks of the irrational and misinformed public and non-scientific rationality is not taken into the account (Wynne, 1995). On numerous occasions it is underlined in the report that "RFID technology has effects on one's personal, professional and public life", however the role of society is being limited to either opening itself enthusiastically to RFID technology or reacting slowly and indifferently to its development (p.102). Just like in the Callon's Model of Public Instruction and Joly's Standard Model, information and education of the public is considered the main goal, which is supposed to enlighten lay people and as a result, facilitate the acceptance of a new technology.

Normative questions and dilemmas are not included in the study. Any ethical, moral or cultural concerns are ignored by the authors of this report and any potential risks which RFID technology may pose, are addressed from the point of view of objective science, and reduced to the issue and technical possibilities of protection of privacy. Such reduction leads to the closing of the potential debate on RFID technology, and its social meaning and effects, which in turn demonstrates a traditional technocratic approach to technology governance.

Accordingly, this report represents an example of the expertise-based assessment in which scientific and technical data was used to assess the potential risks of RFID technology. The complex problems of RFID technology were reduced to a single concern of security and privacy protection and technical solutions to this problem were proposed. Scientific expertise and rationality were the only influential and deceive factors in assessing RFID technology.

4.4 RFID RADIO FREQUENCY IDENTIFICATION: APPLICATIONS AND IMPLICATIONS FOR CONSUMERS

A workshop Report from the Staff of the Federal Trade Commission. United States of America.

Background

The role of *the American Federal Trade Commission* (FTC) ranges from investigating issues raised by reports from consumers and businesses to congressional inquiries. It also enforces a variety of federal antitrust and consumer protection laws. Moreover, recently, the FTC frequently holds workshops to explore emerging issues raised by new technologies. (FTC, 2005)

The FTC's workshop took place on 21/06/2004 at the FTC Conference Center, 601 New Jersey Avenue, N.W., Washington, DC with the intention of investigating both current and anticipated uses of RFID, as well as the associated consumer privacy and security concerns. It was open to the public, and there was no pre-registration and no attendance fee. Moreover, the possibility to send comments was provided to the public. (www.ftc.gov, 2005)

Moreover, the announcement to file comments relating to the workshop topic was made by the FTC. Comments could be submitted up until 9th of July 2004 by post or e-mail. Interested parties were encouraged to answer the following questions:

- *What are the issues surrounding RFID?*
- *How is RFID technology currently being deployed?*
- *What is the future of RFID?*
- *What is the impact on consumers of current and/or anticipated RFID uses?*
- *What approaches have led or will lead to use of RFID in ways that accommodate privacy and security concerns?* (FTC File No. P049106, 2004)

Composition of representatives

As stated above, the workshop was open to the public, consequently attracting a wide range of participants. The representatives of the RFID industry, technologists, scientists, RFID proponents, privacy advocates and policy makers attended the workshop. The representatives of companies such as Philips Semiconductors, Wal-Mart Stores, Intel Corporation, as well as universities MIT University, Pennsylvania State University, U.S. Department of Homeland Security, FTC, and privacy consultants from CASPIAN, and Privacy Rights Clearing House were brought together[8]. The outcome of the workshop was the report "RFID Radio Frequency Identification: Applications and Implications For Consumers" published by the staff of FTC in March 2005.

Purpose of the report

As stated on the page 2 of the report, the main purpose of the organisers was "to discuss the range of applications for RFID, the future of this technology, and its implications for consumers", as well as to address issues such as privacy and database security. Moreover, the organisers of the workshop aimed to "… provide an opportunity to learn about how RFID works and to highlight its numerous and rapidly growing applications….also [to] address the privacy and security concerns associated with RFID use, particularly on an item-level basis…[and] facilitate discussion of core public policy issues and encourage the development of best practices that capitalize on the efficiencies generated by RFID without compromising consumers' privacy and security." (www.ftc.gov, 2005) Moreover, recommendations on how to address the privacy concerns were provided.

Report structure

The report is divided into six chapters which present and summarise the topics of the workshop. The workshop consisted of five panels which discussed following topics:

[8] Full list is presented in appendix 4.

- *The ABCs of RFID* Throughout this session, RFID technology is presented, namely a brief history, as well as how it works and main features were discussed.
- *Current and Anticipated Uses for RFID Technology* In this part current and future uses of RFID technology, both in private and public sectors were described.
- *Implications of RFID Use for Consumers* The consumer privacy implications and database security issues were raised during this session.
- *Looking Ahead: Competing Visions of the Future of RFID* Once again, privacy concerns which are already present and might appear in future were addressed.
- *Meeting the Challenge: Best Practices and Principles* During this part, various proposals to address privacy concerns including technological approaches and self-regulatory efforts were presented and discussed.

RFID Technology

RFID technology is described as " tech's official Next Big Thing". The report underlines that it is not new technology, but applied in new ways, spurred by technological advances and decreased costs. (FTC, 2005,p.1). The detailed description of RFID current and anticipated applications is provided, underlining potential benefits for industry and consumers. However, the workshop participants also acknowledged factors which in their opinion could inhibit the evolution of RFID technology, especially on the item-tagging level. These factors include "the lack of standardisation for RFID frequency and power; inadequate end-user knowledge about how the technology works; and technical challenges, such as reader accuracy and interference from external substances (like water and metal)" (FTC, 2005,p.11).

However, the major implication of RFID technology which was discussed in detail is privacy protection. Participants underlined that there is a variety of factors relating to RFID which might jeopardise consumers' privacy. Among these factors were the physical attributes of tags, such as the small size of chips and readers which enables their unobtrusive integration into goods, and the ability of RFID devices to communicate through materials and at distance, which might facilitate third-party surveillance. The participants raised the issue of consumer profiling and embedding

RFID in customer loyalty cards, which can result in targeted marketing. (Ibid, pp.13-14)

Role of society

Referring to a survey conducted by Capgemini and the National Retail Federation, as well as BIGresearch and Artafact LLC, underlined that the great majority of consumers in the USA (77%) remain unfamiliar with RFID technology. However, among those who were aware, and those who had never heard about RFID technology, privacy emerged as the major concern because of "RFID's ability to facilitate the tracking of consumers' shopping habits and the sharing of that information among businesses and with the government." (Ibid, p.13).

Despite the call from some participants to conduct the independent RFID technology assessment in which various stakeholders including consumers would participate, FTC staff concluded that at present, effective consumer education is required and that effective education tools which inform consumers about RFID technology should be developed (Ibid, p.23).

Role of governance

A variety of approaches as to how to meet the challenges posed by RFID technology were debated during the workshop. Options such as "blocker tags" which would allow the consumers to control which items they want to be blocked and when, and "kill switch", which permanently disables the tag at the point of sale, were proposed. However, the obvious drawbacks including costs of deactivating and the awareness of the tag presence were demonstrated.

While discussing regulatory approaches the participants pointed out the already existing self-regulatory model. This model of facing the privacy concern is the EPCglobal's "Guidelines on EPC for Consumer Products", which apply to all EPCglobal members. The guidance calls for:

- Consumer notice indicating tags' presence on products.
- Consumer choice – the right of users to remove tags.

- Consumer education – consumers should have the opportunity to obtain information about the tags.
- Companies should implement security practices. (Ibid, p.17)

The guidelines developed by particular companies, such as Procter and Gamble or Marks & Spencer, were presented and discussed. Some participants argued that existing industry initiatives represent the effective way to address privacy concerns. However, privacy experts found them to be insufficient and asked for government regulation. Nevertheless, at present no government regulation was recommended by the FTC staff. Industry and its self-regulatory programs were considered as the accountable body for the responsible development of RFID technology.

As mentioned earlier, privacy advocates who participated in the workshop called for formal technology assessment, and requested a refrainment from item-level tagging until such assessment takes place. Furthermore, some participants argued that government action to regulate RFID is necessary, and urged the FTC to implement guidelines for RFID manufactures and retailers. However, other participants disputed these proposals, stating that "…privacy concerns about RFID technology were exaggerated" arguing that such legislation could limit the development and benefits of "such a rapidly evolving technology". As a result the FTC staff concluded that: Industry initiatives and self-regulatory programs can play an important role in addressing privacy concerns raised by certain RFID applications. The goal of such programs should be transparency.

Consumer education is a vital part of protecting consumer privacy. Industry members, privacy advocates, and the government should develop education tools which inform consumers about RFID technology, how they can expect to encounter it, and what choices they have with respect to its usage in particular situations. (ibid, pp.22-23)

Summary

Composition of representatives	**Industry:** Philips Semiconductors, Wal-Mart Stores, Intel Corporation, Procter & Gamble, Sun Microsystems **Government:** US Department of Homeland Security, FTC, U.S. Department of Homeland Security **Academia**: MIT University, Pennsylvania State University **Non-governmental organisations**: CASPIAN, Privacy Rights Clearing House
Purpose of the report	Discussion on: • Applications of RFID Technology • Future of RFID Technology • RFID Technology implications for consumers
RFID Technology	Technology with big potential benefits for industry and consumers. The major implication is a number of technical and non-technical factors that can jeopardise consumer privacy.
Role of society	Society has little knowledge about RFID technology, thus the first step that should be taken is educating society.
Role of governance	No governmental regulation is recommended. Self-regulation by industry considered effective and sufficient.

Table 5 RFID Radio Frequency Identification: Applications and Implications For Consumers

4.4.1 Critical Perspective

Unlike in the first case, in the workshop "RFID Radio Frequency Identification: Applications and Implications For Consumers" organised by the FTC, various stakeholders were invited. Representatives of governmental organisations, industry, academia and consumer organisations participated in the discussion on applications and implications of RFID technology. Such involvement of various social actors broadens the process of design and allows for the identification of social effects at an early stage (Schot, 2001).

However, as underlined by J. Schot (2001), the important condition when involving social actors is "not to structure process too much in advance" (p.244). Nevertheless, while examining the report and documents related to it, it is possible to identify pre-structuring of the discussion about the implications of RFID technology. The participants are invited to discuss "the concerns that consumers may have or maybe should have about [RFID] technology, particularly as it relates to privacy issues" (www.ftc.gov, 2005). Consequently, the further debate was focused on privacy concerns and possible solutions to these issues.

Although the representatives of consumer organisations and privacy consultants were not satisfied with the proposed technical approaches to privacy concerns, and called for independent technology assessment, regulation and even a moratorium on item-level tagging, other representatives were advocating technical solutions and self-regulation. This process of negotiation or bargaining over the conflicting solutions alongside the variety of participating stakeholders, constitutes the type of institutional arrangement entitled by Brekke & Eriksen “Corporative or Interest-representative arrangement”. However, by looking at the final conclusions of the FTC, which, despite the opposing voices of consumer representatives, favoured self-regulation of RFID technology by industry, we can doubt the extent to which opinions expressed by non-scientific experts and government representatives are taken into account. This in turn justifies the argument of Brikke and Erikksen that this type of assessment is based on the assumption that by collaborating with organised interests, scientific experts and government representatives can reach decisions on behalf of society. It demonstrates that this type of arrangement can be used by decision-making authorities as a legitimising tool in order to “…mask traditional form of governance “from the top down”” (Goujon, Dedeurwaerdere, 2006, p.6). Such arrangements are described in P. B. Joly Consultation Model, in which public opinions are listened to, but not necessarily taken into account by the experts and policy-makers in making decisions.

Therefore, it becomes apparent that the opportunity to present and consider a full range of possible implications, as well as to re-consider the meaning and the necessity of the implementation of RFID technology was not ensured. The existing frame of the problem prevented the appearance of views, opinions and concerns which might have been derived from the alternative frame. Not only does such an approach not promote democratic governance of technology, but it also rather restricts and constrains the deliberative attempts within the dominant frame.

4.5 RADIO FREQUENCY IDENTIFICATION

Parliamentary Office of Science and Technology. Great Britain.

Background

Parliamentary Office of Science and Technology (POST) "...is the UK Parliament's in-house source of independent, balanced and accessible analysis of public policy issues related to science and technology" (www.parliament.uk/post). The main objective of POST is to inform parliamentary debate.

> *"The UK Parliamentary Office of Science and Technology (POST) is the closest to Government, although it is a very small office and does not have any official mandate to carry out participatory technology assessment (Joss 1995). The Office was set up in 1993 to provide politically neutral scientific and technical information to both Houses (Commons and Lords) and was envisaged as being equivalent to official technology assessment offices such as OPECST (France), TAB(Germany), DBT (Denmark) and The Rathenau Institute (Netherlands)"*. (Weldon, Wynne, 2001, p.9).

As stated on the POST website, in order to meet their objective POST undertakes a wide range of actions. These actions include:

- *Publishing POSTnotes (short briefing notes) and longer reports. Both focus on current science and technology issues and aim to anticipate policy implications for parliamentarians;*
- *Supporting Select Committees, with informal advice, oral briefings, data analyses, background papers or follow-up research. Committees may approach POST for such advice at any stage in an inquiry;*
- *Informing both Houses on public dialogue activities in science and technology;*
- *Organising discussions to stimulate debate on a wide range of topical issues, from small working groups to large lectures;*
- *Horizon-scanning to anticipate issues of science and technology that are likely to impact on policy.* (www.parliament.uk/post.)

The work of POST falls into four areas:

1. Biological Sciences and Health

2. Physical Sciences, IT and Communications
3. Environment and Energy
4. Science Policy

Following Tamsin Mather, the process of producing a POST note looks as follows:

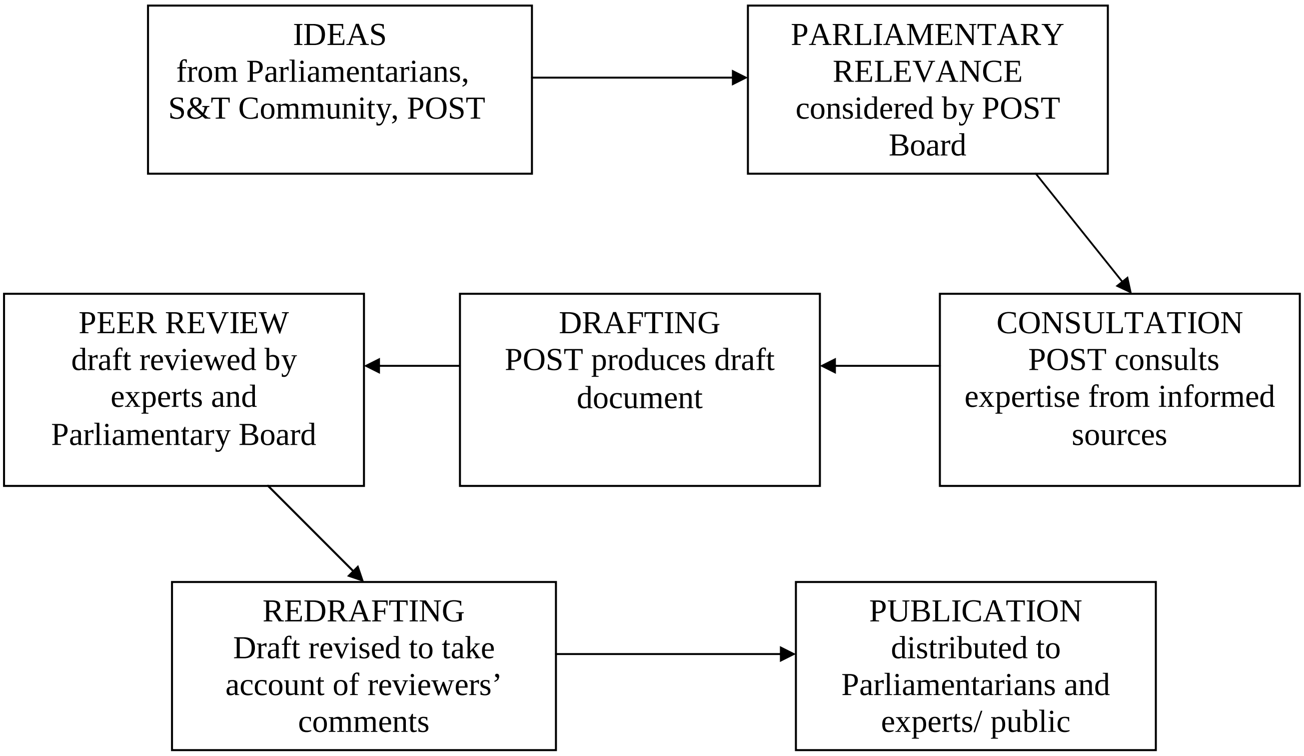

Diagram 1. Writing a POSTnote. (Sourse: Mather, slide 23)

Composition of representative and purpose of the report

There is no information on the report concerning its purpose and authors. However, it is a common feature of all POST publications due to the specifics of its works. As stated on their website, it is the POST Board which plan the objectives, outputs and future work of the Office. The Board meets several times per year. The current Board was appointed in 2005 and it comprises of:

- 14 parliamentarians drawn from the House of Commons (10) and the House of Lords (4), roughly reflecting the balance of parties in Parliament.
- Leading non-parliamentarians from the science and technology community.

– Representatives of the Clerk and of the Librarian of the House of Commons

The Board guides POST's choice of subjects. When the subject is specified, a team of highly qualified advisers conducts analyses, drawing on a wide range of external expertise. All reports and POSTnotes are externally peer reviewed, and scrutinised by the Board before publication.

The purpose of POST's work and publications is to help parliamentarians examine science and technology issues effectively, as well as to support them in decision-making by providing information resources, in depth analysis, and impartial advice.

RFID Technology

In this report, a brief history of RFID technology and its fears are presented. RFID is described as being a "… well established in a number of areas such as electronic payment, supply chain management and livestock tracking, as well as previously unforeseen areas, such as data conveying". (POST, 2004, p.2)

Moreover, RFID tags are represented as "the next generation of bar codes" (Ibid, p.1). The advantages of RFID over bar codes are listed in the report. These advantages include: ease of use, larger capacity to store information and security of tags.

Role of society

The section of the report entitled "Public attitudes" addresses privacy issues raised by consumers and civil liberties groups. It highlights that over 40 organisations have signed the position statement calling for industry and retailers to "agree to a voluntary moratorium on the item-level tagging of consumer items until a formal technology assessment process involving all stakeholders, including consumers, can take place" (Ibid, p.4).

The existing technological solutions such as metal shields and blocker tags, which might help to mitigate concerns over privacy, are discussed in the report. However, it is underlined that such solutions "are not user verifiable" – consumers might be unaware of possessing RFID tags and this could create a two-tier society: the technologically aware and unaware.

Furthermore, citing the summit report “Calling in the chips” conducted by the National Consumer Council, the general unawareness of the majority of the population with regard to RFID technology is underlined “consumers were not aware of RFID technology and certainly did not understand the extent to which their privacy may be jeopardised by its use” (Ibid, p.4).

Role of governance

At present, RFID tags which link items to personal data are subject to the existing Data Protection Act. As stated in the report, the Department of Trade and Industry (DTI) is not currently pursuing any new legislation or regulation. Self–regulation is favoured at the moment, however, if cases of infringement of the Data Protection Act occur, the DTI “…will pursue legislation or regulation to control the use of RFID technology”. (Ibid.).

It is underlined that there are measures being taken by industry to address privacy concerns. Industry, government, and consumer organisations are working together in order to create a UK code of conduct for industry, which will include “…notifying consumers of the presence of RFID tags, education about technology, and adherence to current laws on the collection and storing data.” (Ibid.)

Summary

Composition of representatives	Government**:** Parliamentary Office of Science and Technology
Purpose of the report	To help parliamentarians examine the technology issues effectively
RFID Technology	RFID Technology is a well established technology in various areas, including ones previously unforeseen. RFID tags are presented as the next generation of bar codes.
Role of society	Society is generally unaware of RFID technology and has no understanding of its implications.
Role of governance	Self-regulation is favoured, however, industry, government and consumer organisations are working together in order to create UK code of conduct regarding RFID.

Table 6 Radio Frequency Identification

4.5.1 Critical Perspective

The analysis of RFID technology by the POST was performed exclusively by scientific experts and the members of both chambers of the UK Parliament. Consequently, just as in the case of *the German Federal Office for Information Security* and its report, the possible implications of the technology are reduced to scientific ones. The broader questions such as why do we need RFID technology are not asked. The reduction of the assessment to solely protection of privacy questions once again demonstrates a clear example of framing, which does not allow an open debate about the technology. The UK, being one of the European leaders in the implementation of RFID, views and presents this technology as one of the means of maintaining its competitive economy and market. By drawing the parallel between existing bar codes and RFID tags, the implications and fears surrounding RFID are compared to the ones that existed when bar codes were novelties. Moreover, by presenting the numerous advantages over the bar codes, the justification for the necessity to implement RFID tags is presented.

Once again, the role given to society is limited. The lack of the wider knowledge about the technology, as well as its possible implications is underlined. However, as there were no representatives from the public taking part in the assessment, the public opinions and views were not, and could not have been considered.

This report confirms the arguments of Cruz Castro and Sanz Menendez (2003) and their models of technological assessment presented in the theoretical chapter. They claimed that instrumental models, to which POST assessment belongs, are often dependent on the Parliaments, and therefore lacking autonomy and truly independent and neutral assessment. The general UK attitude towards RFID is to promote and implement the technology, and this is in line with the results of the POST report which underlines a wide range of positive sides of RFID, and suggests that all possible negative implications could be solved by developing new technologies which would reduce or eradicate these negative impacts.

4.6 Comparative analysis

By way of summary, the results of the reports analysis will be presented in the following part. The objective of this thesis was to evaluate the process and problems of technology governance, using the example of RFID technology.

To begin with, the research was focused on the image and meaning of RFID technology presented in the reports. As noted by Bijker (1995) and Wyatt (1998) the way in which technology is understood and presented can influence technology policy. For instance, taking the technology deterministic approach can affect the diversity of actors participating in the decision-making. This derives from the basic assumptions of technological determinism which underline the autonomy of technological development which takes place outside the society. Bearing in mind such an assumption, the involvement of a wide range of actors into the decision-making process does not seem to be necessary. This leads to another crucial issue – participation.

Participation of a variety of actors in assessing technology and its development can broaden the scope of views and questions, and introduce new opinions and arguments into the process. By excluding lay people from this process, the danger of limiting the scope of analysis to a narrow, scientific perspective becomes apparent. Furthermore, public participation in decision-making attempts to improve the traditional 'top down' approach to technology governance, which currently faces problems with legitimacy and trust. Deliberation and democratization have currently become central issues in the technology governance debates. However, despite the recognition of the need for the more democratic governance, there are still numerous problems with incorporating the variety of actors into the decision-making process. These difficulties are clearly visible in the RFID technology reports.

The reports and assessments of the RFID technology performed by the German Federal Office for Information Security and the UK Parliamentary Office of Science and Technology confirm the argument of M. Callon (1998), who claims that the Model of Public Instruction is the most common and widely used model of technological democracy. In the Standard Model of innovation and risk governance P.

B. Joly (2001) confirms this claim, underlining the fact that the separation between 'objective' scientific knowledge and 'subjective' opinion of the public is still common. These two reports are entirely based on scientific knowledge and expert perception of RFID technology and its implications. By analysing the possible risks and implications of RFID tags, the risk factor was reduced to scientific perception, with a wide range of further technical solutions offered with the aim of reducing or eliminating the risk, demonstrating the technocratic approach to the process of technology development. It is underlined on numerous occasions in both reports that civil society does not have sufficient knowledge about the technology and as a result is incapable of holding the appropriate perception of the potential advantages or risks of RFID technology. The need for the education of the public is stressed in these reports. This represents an example of the traditional vertical or top down approach to technology governance. Having consulted scientific experts, policy-makers base their decisions on the results of such consultation, and society's role is reduced to adaptation and accepting or rejecting new technology. Consequently, democracy is deprived in the circumstances where "independent experts arrangements" (Brekke & Eriksen, 1999) are utilised for assessing technology.

By contrast, as we can see from the workshop report published by *the American Federal Trade Commission*, the organisers were advocating a participatory approach to technology assessment. A great variety of stakeholders were participating in the debates, having the opportunity to express their opinions about the technology, its benefits and risks. However, despite the presence of consumer rights organisations such as CASPIAN, the absence of the end users of the technology is apparent. This gives rise to the question about who should be participating in technology assessment and how the participants should be selected. As mentioned earlier, this is one of the most difficult tasks for the organisers to accomplish, as there is always a likelihood that the participants will not represent the entire population. Moreover, in such arrangements the issue of framing is emerging. Analysing the report, it was found that the workshop was organised in a way which did not allow it to go beyond the boundaries of the existing frame. Posing particular problems and questions, such as the implication of RFID technology for consumers, does not leave room for the consideration of, for instance, the social meaning of the technology. Furthermore, although the representatives of consumer organisation had the opportunity to present their opinions, which differed from the scientific views with the regard to the violation of privacy, their proposals were not included into the Federal Trade Commission recommendations. This is in line with the Brekke and Eriksen (1999) observation that in Corporative or Interest-representative arrangements the involvement of non-scientific representatives is used by scientific and governmental representatives to justify their decisions. As P. B. Joly (2001) underlines in his Consultation Model, although the experts take into the account the opinion of industry, there is still a difference in risk perception between the experts and public, and as a result, public opinions are not taken seriously. This results in the same 'top down' approach to technology governance, and proves that participation of the wider range of actors itself does not guarantee the democratic method of governance.

5 EXPERIMENTAL GOVERNANCE[9]

Abstract

As it becomes apparent from the previous chapters, current institutions of governance do not efficiently solve science and technology problems. Consequently, in this chapter I am going to address technology governance from a normative perspective and suggest an alternative to the vertical top-down approach perspective. Not only does it highlight the limitations of the traditional approach, but it also suggests a different route. However, I do not claim that this perspective is a solution to the problems of modern governance, as it would not be possible and it is not the aim of this thesis. It is an invitation to consider how the problems of governance, technocracy and norms could be tackled differently.

5.1 Introduction

As already mentioned, current political institutions do not efficiently solve problems which they are supposed to solve and do not adequately address modern social complexity (Overdevest, 2002). The increasing lack of legitimacy of political institutions indicates the difficulties of modern governance. As Hage et al. (2006) indicate "…Wynne (1996) pointed out, this lack of legitimacy is largely latent and invisible, but very active or even explosive at times" (p. 4). The authors underline that the 'explosiveness' is especially visible in cases where technology deficiencies become apparent (nuclear waste), as science is not capable of solving particular problems, and as politics cannot deploy efficient strategies (for instance, climate change). It becomes increasingly apparent that politics, science and technology are losing their reliability, influence and authority, which in turn generates more mistrust, disputes, and the emergence of alternative problem-solving approaches. These approaches "…*are regarded as a way out of hierarchical led intervention and failures associated with top-down co-ordination; consequently, they propose more horizontal forms of governance, such as interaction and dialogue among network parties, partnerships, self-governance and similar mechanisms. Second, they imply a shift in the locus of democratic politics: from constitutional politics to politics outside*

[9] For the explanation of the concept, see Glossary.

traditional frameworks and institutions, from national to either subnational and supranational levels" (Ibid, p. 6). Consequently, it has led to a normative discourse on the role of civil society[10] in the complex sphere of modern governance.

5.2 Deliberative Democracy[11]

Among the theories which have developed in relation to the role of civil society and legitimacy of modern polity, deliberative democracy has occupied a significant place in a normative debate (Smismans, 2006). "Habermas stresses the importance of civil society in providing a complex communication network of informally organised public – from private associations to mass media – constituting the "public sphere" (Habermas, 1996, p. 275) which may influence political decision-making" (Smismans, 2006, p. 5) Habermas' procedural model of deliberative democracy is based on the relationship between formal decision-making structures and civil society. Therefore, civil society is the vital constituent of his model, which "…collects, organizes, thematizes and communicates public opinion to the formal structures of will-formation within the political system" (Armstrong, 2005, p.11). However, "his [Habermas'] two-track process of collective decision-making with, on the one hand, the spontaneous energy and informal deliberation of civil society, and on the other hand, deliberation within the formal structures of representative democracy has been repeatedly criticised…" for lacking a link between the civil society and the state (Smismans, 2006, p.5). Civil society, although pointing towards disconcerting issues, does not participate directly in decision-making or taking, but relies on parliamentary representation to do so. Consequently, Habermas' deliberative democracy model does not offer a solution to the relationship between civil society and political institutions in modern governance. (Armstrong, 2005; Hendriks, 2002; Smismans, 2006). "The link between civil society and "the state" lies in "politics" via territorial representation, whereas "administration" retains its neutrality and complex private-public governance interactions are difficult to conceive" (Smismans, 2006, pp. 5-6). Therefore, it seems to be challenging to use Habermas' theory to consider the role of civil society in modern governance from a normative perspective.

[10] For the explanation of the concept, see Glossary.
[11] For the explanation of the concept, see Glossary

5.3 Direct Deliberative Poliarchy

The theory of Direct Deliberative Poliarchy (DDP) has been proposed as an alternative approach. (Cohen & Sabel, 1999, Sabel and Zeitlin, 2006)

> *"Directly-deliberative polyarchy is kind of radical, participatory democracy with problem-solving capacities useful under current conditions and unavailable to representative systems. In directly deliberative polyarchy, collective decisions are made through public deliberation in arenas open to citizens who use public services, or who are otherwise regulated by public decisions. But in deciding, those citizens must examine their own choices in the light of the relevant deliberations and experiences of others facing similar problems in comparable jurisdictions or subdivisions of government. Ideally, then, directly deliberative polyarchy combines the advantages of local learning and self-government with the advantages (and discipline) of wider social learning and heightened political accountability that result when the outcomes of many concurrent experiments are pooled to permit public scrutiny of the effectiveness of strategies and leaders."* (Cohen & Sabel, 1999, p.1)

Sabel and Zeitlin (2006) in their paper "Learning from Difference: The New Architecture of Experimentalist Governance in the European Union" analyse new mechanisms of EU governance. They point out the fact that that the current system of decision-making in the EU could be referred to as a "multi-level" system, which joins the EU and national administrations together, but does not create a hierarchy between them: "…the decisions of "lower"-level entities can influence the choice of ends and means at "superior" levels" (p.3).

In this decision-making design, lower level institutions (national ministries, regulatory authorities, etc.) are free to advance in their initiatives, achieving their goals and rule-making. However, in return for this freedom, they are obliged to report regularly on their accomplishments and take part in a peer review. Peer reviews are used to compare their performance with those pursuing other means to the same general ends. The framework aims and procedures are regularly revised by the actors who originally established them and are supplemented by new participants whose views and opinions are regarded as crucial for complete and just deliberation. Therefore, The DDP is considered as a system in which national and local administrations "…learn from, discipline, and set goals for each other" (Ibid, p.11). In the authors' opinion, the wide-ranging institution of peer review, the opportunity to criticise experts and experts' public response to criticisms undermines the notion of indisputable technocratic authority and provides the ground for greater accountability - "…presenting the account of one's choices that is owed to others in comparable situations" (Ibid, p.57). Peer review is seen as a basis for "dynamic" accountability – " …accountability that anticipates the transformation of rules in use" (Ibid). Sabel and Zeitlin claim that …the new architecture of peer review is not itself intrinsically democratic, but rather that it destabilizes entrenched forms of authority—starting with, but not limited to, technocratic authority—in ways which may clear the way for an eventual reconstruction of democracy" (p.59). An essential condition for all forms of democratizing destabilization is transparency. The citizens have the right to know not only what decisions are taken by authorities, but also the evidence and arguments which motivated them to make these decisions. To insure transparency "…there is an increasing tendency in EU networked governance to establish procedural requirements for ensuring active participation by a broad range of stakeholders in regulatory decision-making, including civil society associations and NGOs as well as industry bodies, social partners, and other interested parties" (Ibid, p.62). This diffusion of procedural commitments to transparency and participation in networked governance has a democratizing destabilization effect by encouraging a need to expand the circle of actors and alternatives involved in policy-making. Consequently, the theory of DDP recognises and calls for the autonomy of subsystems and wide participation, and favours the decentralised mode of governance.

Sabel and Zeitlin (2006) study a wide range of examples of European decision-making, such as the regulation of telecommunications, energy, drug licensing, environmental protection, occupational health and safety, food safety, maritime safety, and many others. They point out that in all of the above cases, the new modes of network governance are present. As it is not the main topic of this thesis and its length is limited, just one of the given examples, drug authorisation, will be presented and considered.

5.4 Drug authorisation from the perspective of the Direct Deliberative Poliarchy

The European Medicines Agency (EMA) was established in 1993 with the intention of protecting and promoting public and animal health throughout the evaluation and supervision of medicines for human and veterinary use. It advises the European Commission on the authorisation of new pharmaceutical products for sale on the European market.

The EMA is governed by a Management Board which consists of representatives of the Commission and of the Parliament, one from each member state and, from 2004, representatives of doctors, veterinarians and patients organisations. However, there are no representatives from the pharmaceutical industry itself. The Management Board is supported be expert committees which currently comprise a member of the Commission, three members nominated by the Commission, three representatives of patients' organisations, observers from participating EEA countries, and relevant scientific institutes. The EMA's committees attempt to reach decisions by consensus, however, a voting procedure also takes place. The EMA's peer review evaluation process is conducted through a network of experts nominated by the national authorities. The list of nominees and nominating authorities is available on the Internet with the aim of increasing transparency. Moreover, members of the committees "…are not permitted to have any direct financial or other interests in the pharmaceutical industry which could affect their impartiality. They are required to make an annual declaration of their financial interests and also any indirect interests which could relate to the pharmaceutical industry" (Ibid, p.25).

Hence, the procedure of drugs authorisation looks as follows:

1. Company that wishes to sell its products on the European market applies to EMA.
2. EMA seeks the advise from its network of experts and presents its opinion and judgement.
3. The Commission makes a decision about drug authorisation which is analysed by committees of Member State representatives.
4. In case of disputes, the cases are referred to the European Council.

As a rule, the Commission follows the EMA's advice on drug authorisation. However, if it does not, it must justify its decision. The EMA's recommendations include both risk management and risk analysis, by developing complete policy proposals.

Subsequently, the DDP advocates the expansion of the networks of connections between government and civil society. Cooperation seems to be necessary in order to construct shared policy knowledge, meaning, and to solve problems. Therefore, the DDP " 'decentralises' political decision-making into lower-level units where citizens examine their choices in light of the relevant deliberations and experiences of others, upon which information on these local experiments is pooled at a more central level that will ensure monitoring and encourage mutual influence and learning…" (Smismans, 2006, p.6)

5.5 Summary

While considering the Direct Deliberative Poliarchy, and bearing in mind the way in which the assessment of RFID technology has been organised, it becomes apparent that there is no real connection between the experts and civil society in RFID assessments. The complexity of the decision-making process, the input from "lower-level" units and the possibility to learn, potentially allowing greater deliberation and a dispute of the technocratic authorities and their decisions, are all elements lacking in cases of RFID. There is no cooperation between the experts and the public, but rather the imposition of the experts' decision or consultation of civil society. The role of the public is narrowed down to signalling their discontents and wishes. Accordingly, the participation in technology assessment does not guarantee real democratic governance of technology. Breaking 'the vicious circle' described by Joly (2001) in his third model (Standard Model Revised) and destabilisation of democracy by Sabel and Zeitlin (2006), both seek the conditions which would allow to disturb the existing institutional framing and open it and allow better integration of opposing voices.

However, despite the fact that the central concept of this approach is deliberation, and the search for a collective solution by the wide range of actors who take into consideration each other's views and arguments, the role of civil society and the degree of its engagement into the governance process in DDP is relatively unapparent. The difficulties with engaging the public and maintaining their commitment to the decision-making process can be a difficult task. Furthermore, such institutional constraints as the place of the meeting, timing, and language used may pose challenging problems (Armstrong, 2003). As Smismans (2006, p.7) argues: "the amount of citizens participating directly in forums of deliberation and experimenting will always be limited – due to functional differentiation and complexity in society, even in a much decentralised setting. Which means that most deliberation and experimenting will take place via functional representatives who relate to citizens by associative interaction and representation." Accordingly, this approach does not provide a clear answer as to how to ensure real democratic governance. However, analysing the process of regulation of RFID technology, it becomes apparent, that the way this technology is governed is clearly insufficient. The concept of the Direct Deliberative Poliarchy offers an alternative way of addressing governance and regulation; and by considering such alternatives and experimenting the better route which will allow to better connect citizens and politics might be taken.

6 CONCLUSION

The main objective of this thesis was to address and analyse the problems of modern science and technology governance. By evaluating the process of regulation of RFID technology in three countries: Germany, United Kingdom, and the United States of America, I aimed to explore the differences, similarities, strengths and weaknesses of different national approaches to technology governance. The two initial questions which were intended to be addressed were: how can the perception of technology influence the governance process? What is the role of scientific experts and civil society in this process? Theoretical tools from the STS field enabled me to conduct such an investigation and discover the answers to these questions.

One of the basic assumptions of STS is that technology is socially constructed. This concept denies a still widely held technological deterministic view, which underlines the autonomy and independence of technological development. By analysing the reports on RFID technology, it became apparent that there is a clear link between the perception of technology and the process of governance. The study “Security Aspects and Prospective Applications of RFID Systems” performed by the German Federal Office for Information Security indicates a clearly deterministic approach to technology. The development of RFID tags is presented as inevitable with no social factors being able to change its path. Accordingly, within such approach, taking into account any social factors and including other actors apart from scientific experts, is not considered. This study was entirely scientific-based, which is in line with the traditional technocratic approach to technology governance. While describing RFID technology, its applications, and potential risks, the reduction of the issues to the scientific ‘objective’ facts is apparent. The assessment of the technology was framed on concentrating on risk assessment, more precisely privacy issues. Despite the acknowledgement of some opposing voices to the wide implementation of RFID tags, such opinions are regarded as irrational and resulting from the lack of knowledge about the technology. As a result, the need for public education is highlighted. In such “independent experts’” (Brekke & Eriksen, 1999) approach to technology assessment, an open debate about the technology is not possible, moreover the expertise is used by policy-makers to make and legitimise their decisions.

The same type of arrangement was also used to evaluate RFID technology by the British Parliamentary Office of Science and Technology. While assessing the technology, the numerous potential risks were identified, but the technical solutions were offered as means of mitigating these risks. As mentioned earlier, RFID technology is being actively promoted and implemented in the UK. However, most cases of resistance towards RFID tags, such as boycotting shops or products which use the technology, also took place in the UK. However, once again, the experts see the opposition as irrational and ignorant, and the necessity for education is stressed. Moreover, following Cruz Castro and Sanz Menendez' (2003) instrumental models of technology assessment, which underlines a lack of neutrality and the dependency on parliaments of institutions such as POST, the outcome of RFID assessment does not come as a surprise, considering the policy-makers stance towards RFID. Consequently, there is the apparent clash between 'objective' scientific knowledge and 'subjective' opinion of the public. The decisions made exclusively on scientific opinion represent the traditional 'top-down' approach to technology governance, perfectly described by P. B. Joly (2001) in his Standard Model of innovation and risk governance.

Unlike in the assessments conducted by the POST and the German Federal Office for Information Security, a wide range of actors were participating in the evaluation of risks and applications of RFID technology conducted by the American Federal Trade Commission. A variety of stakeholders were brought together to present their views and opinions on the technology. Nevertheless, the frame adopted by the organisers of the workshop did not allow for a free and open debate. As pointed out by P. B. Joly (2001) in his Model of Consultation, in such arrangements, the public is engaged only in risk management but not in risk definition. Moreover, despite the presence of representatives of consumer rights organisations, the absence of the users of tags is alarming. Such Corporative or Interest-representative arrangements as described by Brekke & Eriksen (1999) are based on the process of bargaining between the interests groups. The wider public involvement is generally used to broaden the debate, but at the same time to make the decisions legitimate and acceptable to the public.

By using Callon's (1998) Models of Technical Democracy and Joly's (2001) Models of Innovation and Risk Governance, it became possible to investigate and evaluate the underlying mechanisms of the process of governance of new technologies. Combined with the theoretical tools regarding the functioning of technology assessment institutions, methods of public engagement and the strengths and weakness of this process, it became possible to analyse the framing of technology governance process, and the problems which this process is currently facing.

At present, as it was pointed out by Callon (1998) and Joly (2001), the traditional technocratic approach to technology governance is prevailing. However, as the numerous controversies over new technologies demonstrate, there is a growing desire of citizens to participate in the decision-making process, especially in situations perceived as presenting risks (Goujon, Dedeurwaedere, 2006). Public engagement into the governance process, as well as its relationship with experts and policy-makers occupies a significant place in academic debates on governance. Specifically, the legitimacy issue of modern polity and governance has revived the idea of wider public involvement. Modern societies, characterised by diversity and complexity, have started to pose a challenge to the top-down approach of governance, and triggered the emergence of new modes of governance.

Attempts to involve public in the technology assessment process are indicating a will to change and reconsider the traditional technocratic approaches. However, in practice such participation poses a major challenge. As it became clear from the evaluation of the "RFID Radio Frequency Identification: Applications and Implications For Consumers" created by the FTC, participation itself does not ensure the reaching of accurate decisions, which from the very beginning could be based on wrong questions or biased discussions. Another problem, the problem of representatives (Callon, 1998), namely who should participate in such debates, is equally difficult to overcome. Moreover, it is frequently assumed that the public has a single public opinion, value, or perspective, which also limits the debate about a technology. (Brekke, Eriksen 1999). Additionally, it is never guaranteed that the policy makers would take seriously the outcome of such assessments and debates, or attach importance to them.

To overcome the limitations of the governance process mentioned above, new experimental modes of governance are currently emerging. These new forms of non-hierarchical, decentralised, network governance are replacing old models of direct intervention based on centralized top-down modes of policy-making, and concentrate on the role of the public "…in interaction with governance, rather than as a sphere outside governance" (Smismans, 2006, p.4).

Alternatives such as the Direct Deliberative Poliarchy, which concentrates on decentralising political decision-making and advocates direct participation of citizens, are offering a new direction for governance. Still being a work in progress, it does not offer a solution to the wide range of problems of modern governance, however it doubtless points out a new way and calls for further experimentation to ensure a truly democratic process of governance.

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GLOSSARY

Governance - the term "governance" was first utilised in France in the eighteenth century and was synonymous with the term "government" (the art and manner of governing). In the next century, and with the same meaning, it was adopted into the English language. It subsequently became obsolete and was not used again until the late 1980s, when the concept was used in the communications of the World Bank. (Goujon, 2000) The Bank defines governance as "…a form of political regime; the process by which authority is exercised in the management of the country's economic and social resources for development; and the capacity of governments to design, formulate and implement policies and discharge functions" (Santiso, 2001, p.12). However, there is a variety of definitions of the concept of governance in social sciences. As indicated by the political scientist R. Rhodes (1996), the concept of governance is currently used in social sciences with various meanings: the minimal State, corporate governance, new public management, good governance, social-cybernetic systems and self-organised networks.

Nevertheless, the prevailing understanding of the concept of governance is "… that it refers to a different mode of societal interaction. Rather than hierarchical and state-centred top-down steering, governance implies a process in which state and social actors interact and are interdependent" (Abels, Bora, 2005). Therefore, the process of governance is based on interaction and communication between multiple actors. Consequently, such a process is not homogeneous. It is organised by different modes and orders, which in various manners relate to the actors participating in the process of governance and their interactions. However, as there are various definitions of the concept of governance itself, there is also a range of frameworks offering various modes of governance. Jan Kooiman (2003) distinguishes between three modes of governance: self-governance, co-governance and hierarchical governance.[12]

Deliberative democracy theory is rooted in the rich interdisciplinary mix of studies and debates surrounding its potential and limitations. It has been influenced by the global attempts to engage citizens in order to address democratic deficit. A wide range of differing schools and perspectives have developed, pointing deliberative democracy thinking into a variety of competing directions.

[12] See Kooiman J. (2003) *"Governing and Governance"*.

Deliberative democracy presupposes "…a genuine dialogue; an entering into discussion prepared for a give-and-take; a willingness to be persuaded, to have one's pre-formed preferences transformed in the face of better argument, and thus to set aside strategic and rhetorical interventions" (www.quantumgovernance.ca)

"The guiding assumptions underlying the ideal of deliberative democracy can be summarized as follows:

- The deliberative process is necessary in order to define the right questions and the range of alternatives on a given public issue.
- Deliberation is the most just system for handling differences of opinion since the strength of the argument takes precedence over the status of the arguers. In this view citizens are not only equal, but endowed with the capacity for reasoned judgment.
- Deliberation is more likely to encourage altruistic behavior since it is focused on the common good rather than self-interest.
- Most people modify or adjust their views after subjecting them to public scrutiny.
- People may not be willing to commit to trade-offs unless they are assured that others will do so as well.
- Deliberation brings out new information and perspectives which may be essential to the formation of sound public policy.
- Public deliberation is an antidote to instrumental rationality in which all private interests are considered fixed and immutable" (London, 1995).

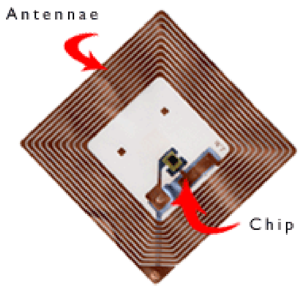
Experimental governance – is the European Union response to regulatory shortcomings. The components of the experimental governance in the EU include: the Open Method of Coordination, the commitment to proportionality or framework legislation, comitology, networked administrative agencies, and transparency as a procedural safeguard. "These permit exploratory learning within and among Member States by contrasting different problem-solving strategies, each informed by a particular idea of the good, with the aim of both improving local performance and creating frameworks for joint action at the Union level" (Zeitlin, 2005, pp. 1-2).

Legitimacy. "The sociologist Max Weber (1918) distinguished between substantive and procedural legitimacy: acts of government that are acceptable either for what they achieve (substantive) or for how they do it (procedural).
Fritz Scharpf (1997) makes a similar point that legitimacy can be won or lost either on the input or on the output side of government: democratic selection of office holders, electoral approval of programmes, public consultation and so on are common ways of securing input legitimacy; meeting public needs and values, andensuring that policy tracks public opinion, are sources of output legitimacy.
Another distinction is offered by the political theorist David Beetham (1991), who argues that there are three components to legitimacy in liberal democratic societies: the performance of institutions; their conformity to democratic values of consent, representation and accountability; and political identity, without which citizens may question the right of a particular collectivity to make decisions on their behalf, however useful those policies, or impeccable the procedures by which they are made" (Lord, 2000, p.3)

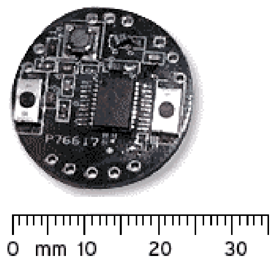
"Civil society is composed of those more or less spontaneously emergent associations, organizations, and movements that, attuned to how societal problems resonate in the private life spheres, distil and transmit such reactions in amplified form to the public sphere. The core of civil society comprises a network of associations that institutionalizes problem-solving discourses on questions of general interest inside the framework of organized public spheres." (Habermas 1996: 367)

Appendix 1

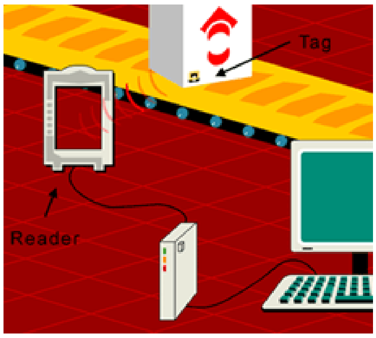
RFID System and its Technical Characteristics



RFID Tag



RFID Reader



RFID System (www.zapped-it.net)

Technical Characteristics of Active and Passive RFID

Although they both fall under the "RFID" moniker and are often discussed interchangeably, Active RFID and Passive RFID are fundamentally different technologies. While both use radio frequency energy to communicate between a tag and a reader, the method of powering the tags is different. Active RFID uses an internal power source (battery) within the tag to continuously power the tag and its RF communication circuitry, whereas Passive RFID relies on RF energy transferred from the reader to the tag to power the tag.

While this distinction may seem minor on the surface, its impact on the functionality of the system is significant. Passive RFID either 1) reflects energy from the reader or 2) absorbs and temporarily stores a very small amount of energy from the reader's signal to generate its own quick response. In either case, Passive RFID operation requires very strong signals from the reader, and the signal strength returned from the tag is constrained to very low levels by the limited energy. On the other hand, Active RFID allows very low-level signals to be received by the tag (because the reader does not need to power the tag), and the tag can generate high-level signals back to the reader, driven from its internal power source. Additionally, the Active RFID tag is continuously powered, whether in the reader field or not. As discussed in the next section, these differences impact communication range, multi-tag collection capability, ability to add sensors and data logging, and many other functional parameters.

	Active RFID	Passive RFID
Tag Power Source	Internal to tag	Energy transferred from the reader via RF
Tag Battery	Yes	No
Availability of Tag Power	Continuous	Only within field of reader
Required Signal Strength from Reader to Tag	Low	High (must power the tag)
Available Signal Strength from Tag to Reader	High	Low

Table 1. Technical differences between Active and Passive RFID technologies.

Functional Capabilities of Active and Passive RFID

Because of the technical differences outlined above, the functional capabilities of Active and Passive RFID are very different and must be considered when selecting a technology for a specific application.

i. Communication Range

For Passive RFID, the communication range is limited by two factors: 1) the need for very strong signals to be received by the tag to power the tag, limiting the reader to tag range, and 2) the small amount of power available for a tag to respond to the reader, limiting the tag to reader range. These factors typically constrain Passive RFID operation to 3 meters or less. Depending on the vendor and frequency of operation, the range may be as short as a few centimeters. Active RFID has neither constraint on power and can provide communication ranges of 100 meters or more.

ii. Multi-Tag Collection

As a direct result of the limited communication range of Passive RFID, collecting multiple collocated tags within a dynamic operation is difficult and often unreliable. An example scenario is a forklift carrying a pallet with multiple tagged items through a dock door. Identifying multiple tags requires a substantial amount of communication between the reader and tags, typically a multi-step process with the reader communicating individually with each tag. Each interaction takes time, and the potential for interference increases with the number of tags, further increasing the overall duration of the operation. Because the entire collection operation must be completed *while the tags are still within the range of the reader*, Passive RFID is constrained in this aspect. For example, one popular Passive RFID systems available today requires more than 3 seconds to identify 20 tags. With a communication range of 3 meters, this limits the speed of the tagged items to less than 3 miles per hour.

Active RFID, with operating ranges of 100 meters or more, is able to collect thousands of tags from a single reader. Additionally, tags can be in motion at more than 100 mph and still be accurately and reliably collected.

iii. Sensor Capabilities

One functional area of great relevance to many supply chain applications is the ability to monitor environmental or status parameters using an RFID tag with built-in sensor capabilities. Parameters of interest may include temperature, humidity, and shock, as well as security and tamper detection. Because Passive RFID tags are only powered while in close proximity to a reader, these tags are unable to continuously monitor the status of a sensor. Instead, they are limited to reporting the current status when they reach a reader.

Active RFID tags are constantly powered, whether in range of a reader or not, and are therefore able to continuously monitor and record sensor status, particularly valuable in measuring temperature limits and container seal status. Additionally, Active RFID tags can power an internal real-time clock and apply an accurate time/date stamp to each recorded sensor value or event.

iv. Data Storage

Both Active and Passive RFID technologies are available that can dynamically store data within the tag. However, because of power limitations, Passive RFID typically only provides a small amount of read/write data storage, on the order of 128 bytes (1000 bits) or less, with no search capability or other data manipulation features. Larger data storage and sophisticated data access capabilities require the tag to be powered for longer periods of time and are impractical with Passive RFID. Active RFID has the flexibility to remain powered for access and search of larger data spaces, as well as the ability to transmit longer data packets for simplified data retrieval. Active RFID tags are in common use with 128K bytes (1 million bits) of dynamically searchable read/write data storage.

	Active RFID	**Passive RFID**
Communication Range	Long range (100m or more)	Short or very short range (3m or less)
Multi-Tag Collection	• Collects 1000s of tags over a 7 acre region from a single reader • Collects 20 tags moving at more than 100 mph	• Collect’s hundreds of tags within 3 meters from a single reader • Collects 20 tags moving at 3 mph2 or slower.
Sensor Capability	Ability to continuously monitor and record sensor input; data/time stamp for sensor events	Ability to read and transfer sensor values only when tag is powered by reader; no date/time stamp
Data Storage	Large read/write data storage (128KB) with sophisticated data search and access capabilities available	Small read/write data storage (e.g. 128 bytes)

Table 2. Summary of functional capabilities of Active and Passive RFID technologies.

(www.autoid.org)

Appendix 2.

RFID Application

Present to Near-term **+1-2 years**	**Mid-term** **+ 3-5 years**	**Long-term** **+ 6-10 years**
Contact-less smart cards: Access systems (subway tickets, car keys, building entry) Payment systems (car toll payment, speed pass, credit cards, library checkout)	Contact-less smart cards: Complex Financial transactions Grocery/Retail item check-out	Contact-less smart cards: Integrated entry/payment systems Bulk checkouts at retailers
Data Verification systems: Security Applications (shipping containers, port security, immigration/border control)	Data Verification systems: Implantable medical chip	Data Verification systems:
Logistics Tracking: Container Level Case/Pallet Level	Logistics Tracking: Tagging fluid-filled and metal-wrapped items	Logistics Tracking: Item Level
Anti-theft/counterfeit systems: Apparel (sewn-in-tags), tags on books, pharmaceutical products	Anti-theft/counterfeit systems: Pharmaceutical and industrial product pedigree tracking	Anti-theft/counterfeit systems:
Smart sensors: Livestock tagging Car Tire Pressure Monitoring	Smart sensors: Smart store-shelves	Smart sensors: Medical diagnostics Integrated Biological, Chemical, IT sensors Smart homes

(Source: Department of Commerce, 2005)

Appendix 3

Experts participating in the “Security Aspects and Prospective Applications of RFID Systems” study conducted by the German Federal Office for Information Security (BSI) in cooperation with the German Institute for Futures Studies and Technology Assessment (IZT) and the Swiss Federal Laboratories for Materials Testing and Research (EMPA):

• Klaus Finkenzeller
Fa. Giesecke & Devrient
Forschung & Entwicklung Chipkarten
Abteilung Neue Technologien

• Christian Flörkemeier
Institut für Pervasive Computing, ETH
Zürich

• Dirk Henrici
Fachbereich Informatik,
Universität Kaiserslautern

• Peter Jacob
Eidgenössische Materialprüfungs- und
Forschungsanstalt, Dübendorf

• Marc Langheinrich
Institut für Pervasive Computing,
ETH Zürich

• Gregor Ponert
Leiter der Abteilung Research &
Development, Skidata AG

• Thomas Schoch
Intellion AG, St.Gallen

• Moritz Strasser
Institut für Informatik und Gesellschaft,
Universität Freiburg

• Jens Strücken
Institut für Informatik und Gesellschaft,
Universität Freiburg

• Dr. Frédéric Thiesse
Institut für Technologiemanagement,
Universität St. Gallen

• Dr. Martin Wölker
COGNID Consulting GmbH

Appendix 4

Radio Frequency Identification: Applications and Implications for Consumers workshop. Panellist.

Panel 1: The ABCs of RFID

Julie Brof, Moderator
Staff Attorney, Northwest Region, Federal Trade Commission
Manuel Albers Director, Business Development for Identification Products, Philips Semiconductors
Dr. Daniel Engels
Director, Auto-ID Labs, MIT University
Sue Hutchinson
Product Manager, EPCglobal US

Panel 2: Current and Anticipated Uses for RF Technology

Lyle Ginsburg, Moderator
Managing Partner, Technology Innovation, Accenture
Charles Harwood, Moderator
Director, Northwest Region, Federal Trade Commission
William Allen
Marketing Communications Manager, Texas Instruments RFID Systems
Ken Fishkin
Researcher, Intel Corporation
Simon Langford
Manager of RFID Strategy, Wal-Mart Stores, Inc.
Paul Rudolf
Senior Advisor for Medical and Health Policy, U.S. Food and Drug Administration
Peter E. Sand
Director of Privacy Technology, U.S. Department of Homeland Security
Lee Tien
Senior Staff Attorney, Electronic Frontier Foundation
Britt Wood
Senior Vice President of Industry Relations, Retail Industry Leaders Association

Panel 3: Implications of RFID Use for Consumers

Ellen Finn, Moderator
Staff Attorney, Division of Financial Practices, Federal Trade Commission
Frederick C. (Ted) Livingston, Moderator
Privacy Consultant
Mallory Duncan
Senior Vice President and General Counsel, National Retail Federation
Beth Givens
Director, Privacy Rights Clearinghouse
Sandra (Sandy) Hughes
Global Privacy Executive, Procter & Gamble
William MacLeod

Senior Partner, Collier Shannon Scott and Counsel, Grocery Manufacturers of America
Deirdre Mulligan
Director, Samuelson Law, Technology and Public Policy Clinic, Boalt Hall School of Law
John Parkinson
Vice President and Chief Technologist, Capgemini
Dan White
Technical Evangelist - RFID, New Technologies Retail Solutions Division, NCR

Panel 4: Looking Ahead: Competing Visions of the Future of RFID

Julie Brof, Moderator
Staff Attorney, Northwest Region, Federal Trade Commission
Katherine Albrecht
Founder and Director, CASPIAN (Consumers Against Supermarket Privacy Invasion and Numbering)
Christopher Boone
Program Manager, IDC
Jim Waldo
Distinguished Engineer, Sun Microsystems

Panel 5: Meeting the Challenge: Best Practices and Principles

Elliot Maxwell, Moderator
Fellow, Center for the Study of American Government, Johns Hopkins; Distinguished Research Fellow, eBusiness Research Center, Pennsylvania State University
Tracy Thorleifson, Moderator
Staff Attorney, Northwest Region, Federal Trade Commission
Dr. Robert Atkinson
Vice President and Director, Technology & New Economy Project, Progressive Policy Institute
Elizabeth Board
Executive Director, EPCglobal Public Policy Steering Committee
Paula Bruening
Staff Counsel, Center for Democracy & Technology
Dr. Ari Juels
Principal Research Scientist, RSA Labs
Cedric Laurant
Policy Counsel, Electronic Privacy Information Center
James Stafford
Head of RFID, Marks & Spencer

(www.ftc.gov/bcp/workshops/rfid/index.htm)