



# Strategies for ICT related business to address societal concerns on legal/privacy Issues

Trustworthy ICT Research in Europe for ICT Security Industry, ICT Security Users and Researchers

**FIRE** is the acronym of **Facilitating Industry Research in Europe**. FIRE is a coordination and support action, funded by the European Commission under FP7, whose aim is to reduce the gap between industry and research in Europe by linking researchers with the needs of the industry and contributing to raising the European industrial competitiveness in the markets of trustworthy ICT.

One of the subjects that prevents from the successful market deployment of the results of R&D projects on trustworthy ICT is the **failure to generate acceptance and demand from people and society**.

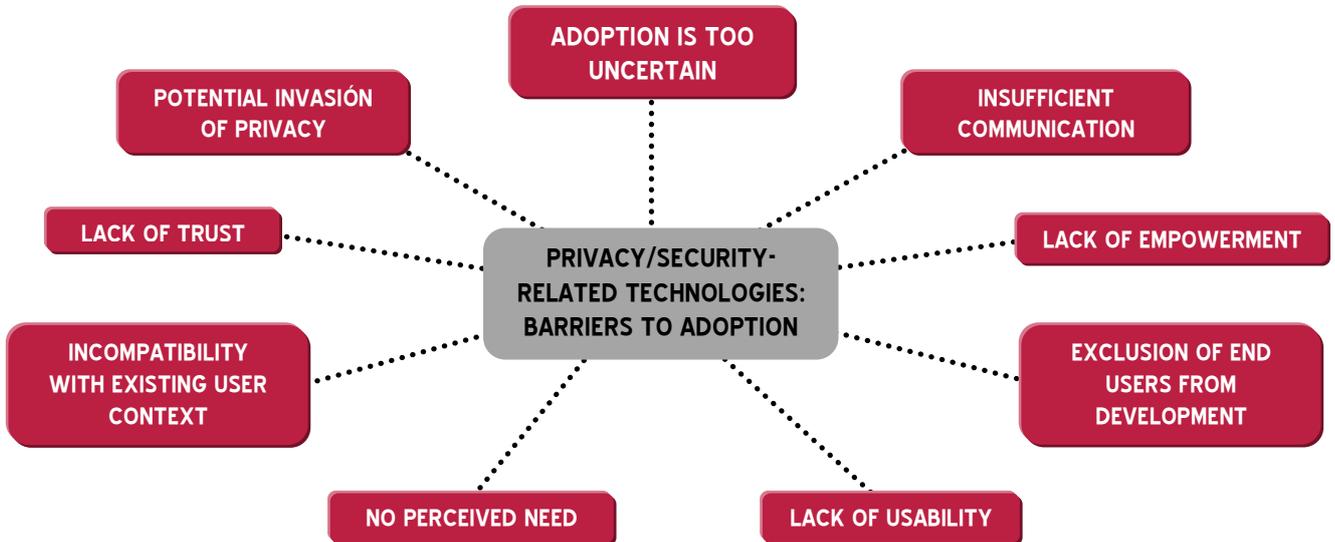
FIRE has carried out a field research of main social barriers to ICT applications adoption. The wider goals in connection to the FIRE project are:

- To provide a better understanding of barriers to ICT applications adoption.
- To inform the industry and the researchers about the possible reasons why some technologies may fail to enter the market.
- To enable this knowledge to be taken into account in developing and assessing various future R&D activities.



# 1. Barriers to ICT adoption

As shown graphically in the following map, seven main types of barriers were detected:



## Exclusion of end-users from development

In this case the development process has suffered from a supply-side bias: the developer has set the agenda – the problem to be solved – and has focused on developing the technological devices to overcome this problem. At the same time it is uncertain to what extent this agenda is shared by the future users. In other words,

- User requirements have remained unclear or underspecified;
- Users have been insufficiently consulted about the technological choices made by the developers;
- Target market has not been clearly and consistently defined;
- The fast evolution of technology forces a continuous revision of initial user needs and market targets;
- Users involvement should be faced from a business perspective to be effective;

## Incompatibility with the existing user context

Contrary to the previous category, in this one the user needs may be well articulated and the users may be willing to adopt the technology. However, this willingness may only be theoretical because of numerous obstacles related to the existing technological, organizational and institutional context that threaten to slow the adoption process down to the point of impracticality. The following barriers were detected:

- The implementation requires too much time and effort, is too complex;
- The implementation focuses on technological possibilities omitting the organizational needs;
- The costs of adoption are too high;
- The solution is incompatible with existing systems and technologies (e.g. business frameworks, organization's planning tools);
- Technology may be too complex for current needs;
- Technology may lack certain crucial functions desired by the user;
- Technology may be too general for current needs;
- Incompatible with business strategy or technical competence of buyer organisations;
- Users involved in R&D have a precise context, like in the living labs approach, that could bias the results and limit adoption.

## The adoption entails too much uncertainty

In this category the user needs may be well-articulated but the users hesitate to adopt the technology because of various uncertainties and potential obstacles that may arise in the adoption process. These risks may be manifested in various contexts (e.g. economic or legal):

- Legal specifications are insufficiently embedded into the technology;



- The intended use of the new technology might be illegal; existing legal context is insufficient or ambivalent;
- It is unclear how exactly (in what conditions and for what purposes) the technology is to be applied;
- There is no example of successful use, no clear business case;
- Companies (and individual) are reluctant to invest in technologies when the standard and interoperability scenario is not well defined. This is a disadvantage for SMEs.

## No perceived need for the technology

In this particular case the users see no need to deviate from the existing solutions and associated practices as their needs are already being served well enough. Once again this situation may emerge for different reasons:

- Sufficient functional substitute to the new technology already exists;
- The technology does not help to solve the problems deemed crucial by the user;
- Collective efficiency does not necessarily translate into an individual one;
- People are saturated of technology and innovations. It is increasingly difficult to have the chance of being just considered;
- Solved needs are increasingly superfluous;
- No perceived problems with current systems. No motivation for wanting a new solution.

## Insufficient communication

This category describes the potential barriers arising from the lack of communication. In other words, the technological solution may well address existing user needs but the developers and the potential users have yet to establish a direct connection. Alternatively, the wider diffusion may require gaining support from various stakeholders. Therefore, the problems pertaining to communication issues are as follows:

- Lack of political support; lack of public support, public awareness;
- The distinctiveness of the new technology from its alternatives has been insufficiently stressed;
- Representation of technological aspects dominates over the consideration of user needs;
- People are overloaded of offers and multimedia multichannel messages. It is extremely difficult to get the attention of anybody;
- There is much rumour, noise and poor information. For the end user it is difficult to distinguish;
- Underestimation of necessary efforts and investment in marketing. Social media has the potential of strongly influence perception, trust and acceptability of a new device or technology;
- Insufficient training and documentation.

## Lack of usability

Usability is related with the time that users need to invest in adopting a new product or service and it is a critical element of market success. This theme unites various factors that influence different dimensions of the usability of the technology, i.e. learnability, understandability, operability and attractiveness. The number of these issues is large, they are often technology-specific and presumably can often be quickly corrected in the design process. Therefore, only a selection of observed issues are noted here:

- Lack of help/support, insufficient documentation;
- Information overflow leading to difficulties with learning to use the technology;
- Too much information is required from the user;
- Too formal thinking is required from the user;
- The look-and-feel of the user interface leaves something to be desired;
- The user interface seems too obtrusive;
- Some tasks are difficult to carry out or cannot be carried out at all;
- Supporting services and/or technologies are deficient, masking the usability of the focal technology.

## Lack of trust

This is another major category which contains a wide variety of different reasons why the users may hesitate to adopt the technology, even if they perceive it as potentially beneficial. Similarly to the category of usability, the number of these issues is large with many reasons being technology-specific. However, it is unclear whether the issue of trust can be overcome as quickly and efficiently as that of usability. Some of the observed issues are:

- The technology is considered immature;
- User-related malpractice may compromise the overall security of the system;
- Inexperience-related malpractice may compromise the overall security of the system;



- The technological solution is unfamiliar, the working principle is not understood;
- Various parties do not trust each other (e.g. the perceived insecurity of government databases, distrust towards service providers);
- Prior negative experience affects trust towards new technologies;
- Security of the solution as a whole is uncertain.;
- Cultural factors have a lot of weight and can lead to the success or failure of a system;
- Perceived lack of honesty from individual vendors or from the sector. Intentionally unintelligible terms and conditions of services (i.e. 12 pages), lack of code of conduct from suppliers, etc;
- The loss of trust in one entity affects to the full ecosystem (i.e. online banking);
- Dual technologies (i.e. monitoring is suitable for surveillance) can create an understandable rejection;
- In general, lack of trust is also related to aversion to change;
- Technological evolution is problematic for many businesses and individuals. This can reinforce the attitude of rejection to change.

## Potential invasion of privacy

Privacy is a growing concern for many people in the digital world, while for other there is a worrisome lack of awareness of long-term consequences of sharing too much personal data. The threat to privacy could prevent some people from adopting some technologies. Data addiction is growing from services providers and terms of use of free services become more demanding in their right to use people data. Some of the reasons for people rejecting adoption are:

- Privacy has not been included as a priority in the design or it has not been adequately transmitted to users;
- Users experience related with privacy in any other application makes the user reluctant to any other service;
- Personalized advertising creates alarm of profiling;
- Privacy by design is a partial solution. It could only fix known problems but the real problems are those coming with the continuous evolution of technology and its use;
- The use of personal data is not clearly explained to the user.

## Lack of empowerment

In this context, empowerment means that individuals or organizations have the skills, education, information and attitude to make their own conscious decisions in the adoption and use of a technological solution in a responsible and secure way. The lack of empowerment is a significant barrier to adoption for several reasons:

- The responsible can't make a decision. It could affect mostly to SME when there is a lack of competence in the buyer organization;
- It motivates insecure user behaviours, from companies and from citizens;
- It could create an unsatisfactory experience

It happens to all, including digital natives, due to the fact that technology evolves fast. It is not the same being able to use the technology than doing it secure and adequately.

## Other barriers

Other barrier was mentioned that could hinder the adoption of privacy/security-related ICT solutions:

- New technologies might pose a health hazard.
- The industrialization phase may take two thirds of time and effort in the development of a new product or service. It includes changes with potential strong influence in users perception and acceptance.
- Sometimes a new technology leads the users to new habits, but it is difficult to foreseen.

**These barriers are co-dependent and shape each other** (e.g. in some cases enhanced usability might increase trust in the product/service). Additionally it was also observed that trust-enhancing technologies themselves seemed to suffer from the lack of trust. Therefore, a view that there is a 'technological fix' to trust-related issues should be avoided as it is too narrow and unrealistic: simultaneous changes in technological, economic, political, legal and cultural domains across multiple institutional levels are required instead to increase collective trust.



## 2. Suggestions to ease the problems

**Six general recommendations** can be made to improve addressing the social aspects of privacy/security-related ICT solutions. Three of them are directed to the industry (1), the European Commission (5) and the scientific community (6) respectively, whereas the rest (2-4) concern the industry-research interaction.

1. **Industry: There is no single recipe to facilitate the adoption process.** A customized approach is needed in each case. In the selection of cases observed and analysed yielded a substantial variation in terms of the scope of the project, commercial maturity, technological maturity, overall function(s), intended context of use etc.
2. **Industry-science interaction: Sociological knowledge about the evolution of technological artefacts and systems should be integrated into the development of new products.** It is notable that whereas various techniques of user involvement were enthusiastically used in the projects, the discussion about the appropriateness of these techniques lacked references to the social context of their deployment.
3. **Industry-science interaction: The attempts to reduce social barriers to privacy/security-related ICTs should be based on explicit considerations of the phase of development of the technologies in question.** If the dynamics of technology differ from one phase to another then it is sensible to presume that the appropriate measures to facilitate the development and adoption of ICT solutions should also vary accordingly. In other words, depending on the particular phase of development different barriers become relevant and therefore different strategies should be considered. For instance, usability assessment may not be relevant for every technological development process.
4. **Industry-science interaction: The industry needs to approach the researchers (of the social) with specific questions in mind in order to ensure the co-evolution of theories of technological dynamics and the integration of this knowledge into product development.** While stimulating ideas and exploratory research abound, systematic bodies of work testing very specific claims across various contexts are often incomplete or missing altogether. This issue might be resolved if the industry approached the researchers (sociologists of technology) with quite particular and specific problem agendas.
5. **European Commission: Future project proposals should contain sections explicitly outlining reasons whether and why user involvement would be considered necessary (or not).** It is a personal observation of the author of this research that 'user involvement' has recently become a fashionable topic. It is not at all far-fetched to conclude that phrases such as this are being rhetorically employed in various project proposals to appeal to the evaluators.
6. **Science: Further research on ICTs and trust is needed.** Although trust and ICTs is a topic that has certainly garnered some attention, the lack of trust still keeps emerging as one of the major barriers to adoption. This indicates that either our understanding of ICT-related trust issues is still incomplete or the cross-fertilization between scientific findings and product development is yet to happen.

**Some specific recommendations** can be made to specifically address the social aspects of privacy/ICT security in the context of **public funded research**:

- Many of the expressed problems are coming out of an **inadequate market analysis** in the first place (in proposal time) and of an **insufficient marketing plan or dissemination approach in the second** (in project time) and/or the lack of updating both along the project time.
- Simple endorsement of the proposal by the end-users would not be enough. Some **previous work with users** should be done in advance to align the proposal with real interests.
- **End-users participating in a project have to have their voice guaranteed**, including the opportunity of autonomously communicate with the funding institutions about occasional malpractice in the project. End-users' satisfaction must be separately evaluated by third parties (reviewers or others).
- **Regular innovation management procedures** and **standardized market plans** would be mostly recommended. Innovation management systems should be able to explicitly validate end-users.
- It is important to emphasize that technology doesn't solve problems: technology solutions do. And technology solutions are more complex than a development of a prototype or pre-prototype. Thus, it would be convenient to include some **demonstration exercise with different end-users** than the ones participating in the project.



- In many cases there is **no real intent** on the part of many participants **to put the results to market**. Long term evaluation of market plans would be convenient.

### 3. Methodology

The results presented here are based on two previous documents. First one is the basic research obtained by a qualitative coding of 11 projects (mainly FP7 Trust and Security, CIP ICT Policy Support Programme): ACTIBIO, AVANTSSAR, ECRN, PICOS, PoSecCo, PRIMELIFE, SecureSCM, SHIELDS, TAS<sub>3</sub>, UaESMC and UTRUSTit. The projects were chosen, from a pool of 110 European R&D projects<sup>5</sup>, according to their proximity to actual use experience: actual implementation experience was prioritized over interviews with users and other similar methods which, in turn, was prioritized over expert assessments about users' needs and wants.

The results obtained from this previous process were presented in several workshops and results were collected in another document.

This one is the compilation from both documents main outcomes, not necessarily representing the opinion of consortium members. The research presented in this document can be substantially improved by further research.

### 4. Further Research needed

The research presented in this document can be substantially improved by focusing on the following aspects:

- To include more cases in order to expand and refine the typology.
- Subsequently the research could be taken on the next level by locating the critical problems, assessing their relative strengths and detecting the causal influence between the barriers.
- The practitioners are unlikely to be surprised by the majority of the above findings: after all, the issues of usability or the failure to consider the context of use have been recurring themes addressed over decades in the fields of Science and Technology Studies, Social Informatics, and Human-computer Interaction. Therefore, it might be useful to shift the analytical focus and ask why, despite all the apparent advances in detecting and dealing with user requirements, similar barriers to adoption continue to emerge? Are the majority of the flaws simply minor now, are we dealing with some fundamental limits to foresight or have the practitioners become far more attentive to 'failures', however the latter are defined?