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Predatory Strategies in Standards Wars:

On Creating Fear, Uncertainty and Doubt

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ABSTRACT

In standards wars, FUD (Fear, Uncertainty and Doubt) is sometimes created to weaken an opponent's market position. Little is known about these strategies, their use in committee standardization settings and how to respond to them. This chapter explores this phenomenon. It (i) identifies various FUD strategies, (ii) their context of emergence and (iii) their effect on the dynamics of a standards war in a historical case study: the European standards war on digital mobile radio communication in the 1990s.

The study highlights the need to distinguish 'FUD as perceived' from 'FUD as intended'. FUD strategies and case-specific characteristics of their emergence are illustrated. The chapter shows that perceived FUD polarizes and entrenches positions of warring parties thereby affecting the course of the standards war. The authors conclude that, given its impact, reflection by corporate standardization managers on (perceived) FUD, preclusion, counter-strategies and the downscaling of standards wars is warranted.

Keywords: FUD, Strategies, Standards War, Committee Standardization, Digital Mobile Radio Communication, Emergency Services, ETSI, Matra Communications, Tetra, Tetrapol, TDMA, FDMA, Counter-strategies

INTRODUCTION

In the early 1990s, several European member-states decided to replace their analogue radio systems for the police, ambulance and fire brigades by advanced digital systems. Their decision coincided with the aim of the Schengen Agreement to create a Pan-European network for public safety that would allow the police to use the same handset across national networks during 'cross-border surveillance and hot pursuit' (Schengen, 1990). It also concurred with activities of the European Telecommunications Standards Institute (ETSI). Supported by the European Commission, ETSI had started work on a standard for digital mobile radio communication in 1988. One of the objectives was to define a common air interface that would ensure that any standard-compliant terminal (e.g., handset) could run on any European network regardless of the network supplier. A number of countries considered the Tetra standard, as it was called, to be a promising means for achieving the Schengen aims.

However, in April 1994, the period in which ETSI was approving the air interface technology (TDMA) of the Tetra standard, an incompatible competing technology (FDMA) was gaining support among European countries. The latter technology had already been developed by a French company called Matra Communications and implemented in 1992 for the French gendarmerie. To improve access to the European market, FDMA advocates also attempted to get their technology formally acknowledged as an ETSI standard. Initially they seemed to succeed. Early 1995, however, ETSI dropped FDMA from the work program. This was a conspicuous decision, according to Bekkers (2001, p. 380), given the number of suppliers supporting FDMA and FDMA being the preferred choice of a number of public safety network operators. It was the beginning of a standards war. Standards wars are fought in markets as well as in and between standards committees (Besen, 1991). The TDMA-FDMA war foremost took place in a standardization setting. It involved a committee

standard of a formal standards body (i.e., an ETSI specification based on TDMA technology) as well as a de facto standard (i.e., FDMA technology implemented in products by Matra) that later became a consortium standard (i.e., the FDMA-based technical specification of Tetrapol Forum). It was a ‘rival revolutions’ type of standards war (Shapiro, 1999). In such wars, two factors determine the stakes and the dynamics. First, the rival technologies are *incompatible* (Shapiro, 1999). This was the case, for example, in technology wars between Blu-Ray and HD-DVD (Gallagher, 2012), e-purse systems (Vries, 2006) and proprietary platforms (West, 2003), to name a few de facto standards wars. Incompatible technologies were also at stake in wars between committee standards, for example, in the field of wireless telecommunication (Lee, 2006) and for DVD formats (Dranove, 2003). A second and related defining factor in standards wars is the effect of rival technologies on *network externalities*. The term refers to an increase in value of the network with every new connected network user (Farrell, 1985). Rival networks based on incompatible technologies or standards cannot exploit each other’s externalities. For example, owners of a certain smart phone cannot usually make use of the infrastructure of a different smart phone for spare parts and customer services. In past studies, the workings of network externalities was a main reason to presume that in IT markets only one competing technology would be able to survive (‘winner-takes-all’). While more recent work indicates that there may be room for two or more standards (Singh, 2009), the presence of network externalities has been shown to heighten the stakes in standards wars. Given these stakes, “[w]hen it comes to standards wars, traditional principles of strategy, while helpful, are not enough” (Shapiro, 1999), and some companies will turn to predatory market strategies.

The predatory strategies addressed in this chapter are those that create Fear, Uncertainty and Doubt (FUD), a category referred to by Pfaffenberger (2000). To our knowledge, no other studies have as yet analyzed standards wars on the use of predatory market strategies and FUD strategies, in particular. Perhaps understandably so. The term ‘FUD’ is foremost referred to in business magazine and trade journal articles to capture a class of industry strategies that are perceived to be unfair and used to publicly denounce certain market practices. That is, it is used in a decidedly normative and non-scientific way. The challenge for scientific research on FUD strategies is how to take in and address the inherent subjectivity involved in attributing unfairness. This point is revisited when defining FUD strategies in the next section.

Trade literature on standards wars indicates that companies have difficulty knowing how to deal with FUD strategies. When feeling cornered, companies risk retaliating with defensive counter-strategies that are ineffective and/or may unwittingly escalate problems. Our assessment is that corporate standardization managers lack certain insights that are necessary to consider pre-emptive action and recognize alternative strategies. In the following, we hope to feed them with insights that help them in their decision making. We aim to shed more light on:

- (i) How may FUD strategies manifest themselves?
- (ii) In which context do they emerge?
- (iii) How do they affect the dynamics of standards wars?

Given the scope of these questions, we limit ourselves to studying standards wars involving committee standardization, an area underrepresented in scholarly literature. We expect the occurrence of committee standards wars to increase in tandem with the rising emergence of standards consortia (Egyedi and Hawkins, 2010). Furthermore, given the explorative nature of our questions, we present the findings of a historical case study on the use of FUD strategies in the committee standards war introduced above (Yin, 2009).

Our data were primarily gathered by means of extensive archival research on exchanged letters, policy documents, etc.ⁱ from three archivesⁱⁱ and secondary literature. Twenty in-depth interviews with key actors were held to enrich our general understanding of the case. Five of them are referred to in this chapter as they have immediate relevance for answering our research questions and help illustrate and contextualize our archival dataⁱⁱⁱ.

Below, we first review scholarly literature on predatory strategies and standards wars for insights that help define FUD behavior and its effects. Next, the case of the European standards war on digital mobile radio communication is further introduced. Used FUD strategies are identified and discussed.

We conclude by revisiting our research questions and reflecting on lessons learned for corporate standardization managers.

FUD STRATEGIES IN STANDARDIZATION

In the 1970s IBM was accused of using FUD to ward off new market entrants (Pfaffenberger, 2000). Gene Amdahl remarked after he left IBM to found his own company, the Amdahl Corporation: "FUD is the fear, uncertainty, and doubt that IBM sales people instill in the minds of potential customers who might be considering Amdahl products" (Raymond, 2009). Drawing a parallel with Microsoft's reactions to the rising popularity of the Linux platform, Pfaffenberger (2000) defines FUD as "a marketing technique that a market-dominating firm employs to blunt a competitor's first-to-market advantage". (We will re-address his definition later on.) He lists techniques that may be part of a FUD campaign such as "press releases designed to confuse costumers about the merits of the new product, and benchmark tests – generally rigged in the market-dominating firm's favor – that raise questions about the new product's performance (...)" and the predatory preannouncement of vaporware (i.e., a product which does not and may never exist) "that can be timed to steal the momentum from a competitor's technologically superior product" (Pfaffenberger, 2000).

Systematic studies of FUD strategies used in standardization settings are lacking. But, as certain parallels can be drawn with strategies used in highly competitive markets and de facto standards wars, some insight can be gained from technology management, economic, standardization and marketing literature in this field. In such situations, Shapiro and Varian (1999) recommend two basic marketplace tactics, i.e., pre-emption (being first to market and learn from positive feedback) and expectation management. Regarding pre-emption, where a committee standard is based on an existing technology, prior market experience with the technology offers clear benefits (first-mover advantage). In line, the benefit of early experience with implementing a standard tempts some companies to prematurely implement draft standards (Jakobs, 2008).

As for managing the expectations of consumers and competitors (Shapiro and Varian, 1999, p.273), this may include the use of predatory preannouncements (Haan, 2003; Wu, 2004; Bayus, 2001) and vaporware, tactics that also fall within the remit of FUD strategies. Product preannouncement refers to a "formal, deliberate communication that release[s] information about a product well in advance of the product's actual introduction" (Wu, 2004). Predatory preannouncements and vaporware can be very successful in creating uncertainty in markets among competitors and consumers (Haan, 2003; Bayus, 2001). They also play a role in standardization settings. The preannouncement of new standards or standards versions is a common occurrence. During the DVD recordables standards war, for example, both rival consortia regularly announced new standard versions with increased recording capacity and speed. This led to a race between new standards versions (Gauch, 2008). Preannouncement of a new standards version can undermine the momentum for a competitor's standard's launch. If the preannouncement signals that the newcomer will not survive competition and that customers are to 'hang on' in anticipation of a new version, it can also deter newcomers from market entry (Haan, 2003; Bayus, 2001).

In respect to standards wars' in and between standards committees, the procedures of standard bodies and consortia, however fair and impartial, cannot safeguard against the use of predatory strategies (e.g. Oshri, 2006; Wegberg, 2004). Examples of (perceived) misuse of the formal rules are staging a standards vote during the holiday season, when most participants will be absent, and defecting during the final vote after lengthy but seemingly fruitful negotiations in a situation where 100 % consensus is required to proceed (<http://www.nooxml.org/irregularities>). Furthermore, increasingly lawsuits are used to settle standardization disputes. Fear of lawsuits sometimes paralyzes standards processes and may cause companies to withdraw from the standards process (Egyedi, 2001).

Pfaffenberger's (2000) description of FUD as "a marketing technique that a market-dominating firm employs to blunt a competitor's first-to-market advantage" assumes that FUD is intentional and therefore involves predatory strategies. However, it is often difficult to distinguish between strategic and innocent action (Haan, 2003; Bayus, 2001). Possibly FUD is raised unintentionally. Moreover, how should one methodologically address behavior that is intended to create FUD but is not perceived as such by the targeted party? A clearer definition is needed.

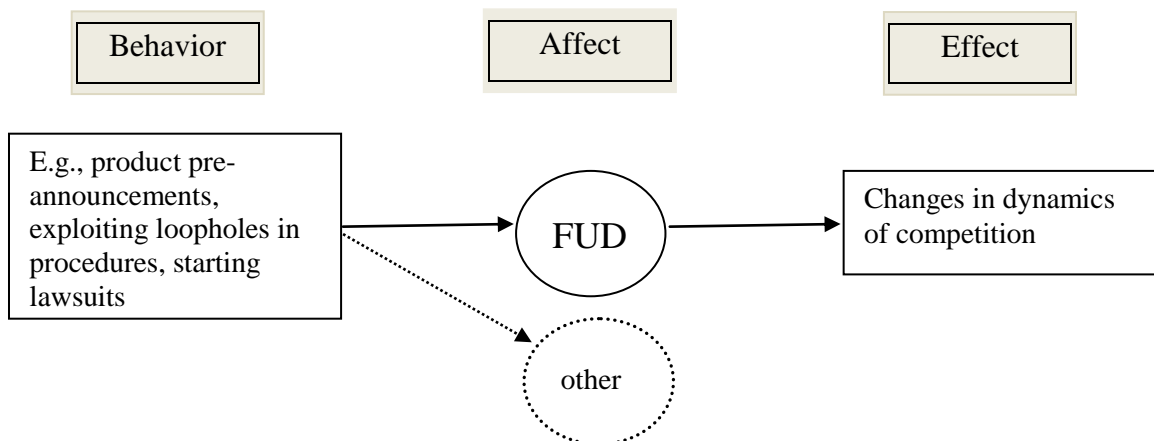
FUD Strategies	Perceived	Not perceived
Intended	A	C
Unintended	B	D

Table 1. Focus of the case study is on perceived FUD strategies (A and B)

We use the word *affect*, that is, a psychological term for feeling, experience or emotion. To make possible a more systematic study of FUD, the *affect* of Fear, Uncertainty and Doubt that results from certain behavior must be conceptually de-coupled from *intentionality*. This implies two basic lines of enquiry: one focusing on the perspective of the sender ('FUD as intended' in short) and the other on the receiver ('FUD as affected' in short). In general, companies are understandably reticent about providing outsiders information on their market strategy. The same applies to their standardization strategy. In addition, the intention of creating FUD is not a societally acceptable standardization strategy, as trade journals indicate. As a result, data on intentional FUD is hard to come by. In this case study, we therefore focus on 'FUD as affected' (see instances A and B in Table 1). We only refer to 'FUD as intended' if self-reported and if perceived as such.^{iv}

Figure 1 illustrates that certain *behavior* may or may not give rise to the *affect* FUD, whether intended or not (see Figure 1).

Figure 1. Key elements of a conceptual model for studying FUD strategies. It distinguishes behavior from how behavior is experienced (*affect*) and what it leads to (*effect*).



Consequently, we define the strategy of creating Fear, Uncertainty and Doubt in standardization as: a market strategy *perceived* to be designed to create unease among competitors and raise concern among users about the consequences of selecting a competitor's standard, by exerting pressure - psychological, legal or otherwise - and disseminating negative and/or incorrect information about the standard, the standards process or the standard's likely market uptake, as a result of which the credibility of the competitor and/or the competing standard is undermined.

FUD strategies feed uncertainty among standardizers and market players. Typically, uncertainty undermines competition in network-based markets (Farrell, 1986), a market to which our case also belongs. It leads to hold-ups of investments (Williamson, 1979). Producers will try to postpone investments for fear of investing in the 'losing' system and having to write off sunk costs (i.e., costs that are specific and irreversible and cannot be retrieved). The same hesitations exist on the side of consumers. They fear being stuck with an incompatible system, that is, of becoming an 'angry orphan' (David, 1987). Uncertainty arising from creating FUD in the standards setting or in the market causes market stagnation.

The case study's primary source for perceived FUD behavior and its effect are three public and private archives and data from interviews with former stakeholders. Key data are instances in the archived documents and interviews in which stakeholders themselves frame behavior as creating FUD. In our case, the archives almost exclusively made reference to the FUD strategies of one party - in the perception of the other party. Different causes may underlie this asymmetry. For example,

methodological causes (inaccessibility of certain archives and interviewees) or case-related causes (e.g., asymmetry in *documented* FUD or different actor perceptions about what is a fair strategy). Whatever the cause(s), our aim is not to retrospectively choose sides in the standards war, but to contribute, empirically, to FUD studies by identifying (new) FUD strategies and, analytically, by exploring the conditions under which such behavior may emerge.

INTRODUCING THE CASE: TETRA VERSUS TETRAPOL

Although initially intended for a wider market (Bekkers, 2001), Tetra eventually became adopted as a standard for public safety networks in Europe under the influence of the Schengen Agreement. The police officials, who played a leading role among the potential users of Tetra, and the national governments of the - at that time five - Schengen countries (Belgium, the Netherlands, Luxemburg, Germany and France) saw it as an opportunity to meet a number of core objectives of the Schengen Agreement (signed June 14, 1985), a feeling that was shared more widely when the Schengen Agreement became officially adopted as EU policy in the Treaty of Amsterdam of 2 October 1997. In the late 1980s, incompatible systems made direct connection between cross-border police units impossible. To overcome this, the Schengen Agreement outlined a short-term strategy (ad hoc improvements and bilateral agreements for police cooperation) and a long-term strategy aimed at developing a “uniform police radio communication system using common frequencies for exclusive use by the police” (#1). The latter required a common European communication standard like Tetra. The expectation was that “standardization would lead to a better quality of the cooperation between the emergency services, increased efficiency and increased effectiveness in case of large-scale emergencies.” (#2)

The mobile digital radio system which ETSI started developing in 1988 was called MDTRS (Mobile Digital Trunking Radio System). In 1992, it was renamed Tetra (Trans European Trunked Radio, and later, when its possible use outside of Europe became clear, TERrestrial Trunked RADio). In March 1991, the MDTRS specifications were prognosed to be ready at the end of 1992. The first tests were expected to be done in 1993/1994, and early 1995 the first systems would be operational.

The expectation of a smooth and quick standards process proved too optimistic. The first problems became apparent in 1993 and involved a competing technology that was later to be called Tetrapol. Tetrapol had been developed on request of the French government by the French company Matra Communications. Based on an FDMA access mode, this technology was the building block of the Rubis radio network for the French Gendarmerie (1992) and Acropol (1995) for the national police forces and fire brigades. The French put much effort into convincing other European countries of the advantages of the FDMA air interface technology underlying Tetrapol. But FDMA was incompatible with the TDMA air interface technology that was already being standardized in ETSI and was to be approved in 1994. Most TDMA proponents opposed standardizing two incompatible technologies. However, support for FDMA was growing, and in 1993 a number of operators and manufacturers (Bosch, Matra, Alcatel etc.) proposed the inclusion of the FDMA standardization in ETSI's work program. FDMA was argued to be more suitable for high coverage and low traffic density areas such as the countryside. TDMA was thought to better address high density communication and low coverage typical of urban areas. Given these complementary advantages, the FDMA proponents argued, it was appropriate to standardize both air interface technologies. Intense debate among suppliers and member-state representatives followed.

The beginning of the standards war can be pinpointed to early 1995, the period in which the ETSI committee decided to drop work on FDMA. (Hence forth the TDMA and FDMA technologies are referred to as a *pars pro toto* for Tetra and Tetrapol, respectively.) Companies such as Matra and Motorola played a pivotal role in the ensuing standards war. Matra left ETSI and decided to market its system under the name ‘Tetrapol’. By then, it had more than two years of experience with the network of the French gendarmerie (Bekkers, 2001, p. 385) and had started rolling out Acropol for the French national police force and fire brigades. That is, it had a first-mover advantage in the market for public safety networks, which had the Schengen countries and the Police Cooperation as potential customers. In addition, the value of Matra's Intellectual Property Rights (IPRs) on the Tetrapol technology depended on the outcome of the standards war. The French government – representing a large and therefore influential member-state, geographically central to Europe and bordering with several other

countries - promised to play the role of launching customer. Because it had high sunk costs and was locked into Matra's market. It had a direct stake in the standards war, even apart from having national industry interests like virtually all countries (e.g., Germany and the US).

Motorola's reasons to promote Tetra as a standard for public safety radio communication was that it wanted to re-use its technologies – and IPRs - in the development of Tetra. It had, for example, worked on a TDMA system that could serve in an adapted form as the technological base for the Tetra specification. The company already had an FDMA system in their portfolio (APCO 25), but it wanted to use this exclusively for the American market. Early on in the development of Tetra (1994), it publicly announced its intention to bring Tetra to the market. This raised the expectations of other manufacturers and end-users. It was the first company to invest heavily in Tetra and install Tetra test systems (on the Island of Jersey). In sum, both Matra and Motorola had a good starting position and ample reason to wage a war.

IDENTIFYING FUD IN THE CASE

In the following, occurrences in the Tetra-Tetrapol standards war are discussed that were perceived as creating FUD. The narratives are based on primary archival documents and, where possible, were confirmed by interviewees.

Confusion about Standards Names

In 1993, French and German technology suppliers (Bosch, Matra, Alcatel etc.), supported by the Schengen Telecom group, urged for a second, FDMA-based Tetra trajectory. The distinction Tetra 6 (FDMA) and Tetra 25 (TDMA) was introduced (i.e., based on the channel width of 6.25 kHz and 25 kHz, respectively). To outsiders, the names Tetra 6 and Tetra 25 suggested two standards options with little difference. Since both were called Tetra, the question of their (in)compatibility was not likely to be raised.

What happened before was that soon after the ETSI standards committee had renamed MDTRS to Tetra in 1992, Matra registered the name 'Tetrapol'. (Interview [5], former chair of ETSI Tetra committee). The name appears in the archives from 1993 onwards. As support for Tetra 6 within ETSI died down and was dropped in 1994 from its work program (#3), Matra increasingly used 'Tetrapol' to refer to the Rubis and Acropol networks.

Matra had chosen this name deliberately to put the FDMA-solution on the same plane as Tetra (Interview [1] Chairman of Tetrapol Forum). The similarity created much confusion. It positioned Tetrapol as a Tetra version developed for the police instead of a competing solution (Interview [2], Dutch representative in Schengen Telecom). Tetrapol made a 'claim by name' for a connection with Tetra (#4). By implication, ETSI, being the developer of Tetra, also sanctioned Tetrapol, which gave credibility to Matra's proprietary system. "This is deliberately misleading to users" (#5).

Over the years, the Schengen Telecom Group became an increasingly important user-player. Late 1993, it decided that an open ETSI standard would be needed to create a multi-vendor market. The Schengen Telecom group delegated, as it were, the technical decision making to ETSI. The term 'ETSI standard' became conditional for acquiring the group's support. Therefore, when ETSI decided not to pursue the Tetra 6 option, the Schengen Telecom group closed the door on Tetrapol (#6).

Confusion about the Status of Tetrapol

The Tetrapol proponents, not having achieved direct access to ETSI standardization, then explored indirect means of becoming ETSI 'accredited'. In December 1995, Tetrapol Forum expressed its wish to submit the Tetrapol technology to the so-called PAS (Publicly Available Specification) procedure in order to become a recognized ETSI standard. ETSI had introduced this procedure earlier that year "(...) to accelerate standards-making in Europe through [sic] the recognition of standards other than those produced formally within ETSI itself. (...)" (#7). Approval of Tetrapol via the PAS procedure would accredit it as an ETSI standard and provide it a status equal to that of the Tetra standard.

Tetrapol Forum submitted a formal request to ETSI on May 29 1996, and presented its specification on June 27 1996 (#8). Shortly afterwards, the ETSI Board decided that Tetrapol was eligible for the PAS procedure. Next in the PAS procedure, the ETSI committee was to evaluate if Tetrapol met the

PAS criteria, one of which was that the PAS should not cover the same scope as an existing or proposed ETSI specification. (#30) An extra committee meeting was scheduled for 21-22 October 1996. But just prior to the meeting, Tetrapol Forum withdrew its request because the meeting had been announced too late and it had had too little opportunity to effectively lobby for votes (#21). Possibly it had guessed that behind the scene Tetra supporters, from government representatives to Tetra-manufacturers, had been lobbying successfully for a rejection of the Tetrapol PAS application. In a letter, Tetrapol Forum wrote:

The option of transferring the TETRAPOL P.A.S. to a Technical Specification might be more appropriate than the present proposal to transpose to an I-ETS. (...) In conclusion, we formally withdraw our request of 29 May 1996 for transposition to a P.A.S. (...) We further confirm our intention of restarting the procedure with (...) the new working rules for ETSI. (#9)

The letter created confusion and uncertainty. It unsettled ETSI members, first, because the loose use of the word ‘P.A.S.’ sharply contrasted with ETSI’s specified use of the term ‘PAS’^v (“(...) any manufacturer or organization can publicly offer a specification and call it a PAS but this is nothing to do with ETSI.” (#10)

Second, it raised the possibility of Tetrapol becoming a Technical Specification, which could create confusion and hurt the interests of TDMA proponents almost as much as a second Tetra-variant would.

With the current PAS-procedure the chances are almost zero that Tetrapol will become an EN (European Standard – the name for an open European Standard). It might sooner become a TR (Technical Report) (...). The status of a TR is low. But we are very likely to run the risk that those not well-acquainted with ETSI procedures (i.e. most people!) will not understand the difference between an EN and a TR. Matra may phrase it as that Tetrapol has been accepted by ETSI (#11)

Third, announcing that this PAS effort would not be the last one prolonged uncertainty about Tetrapol’s status and Tetra’s position in the market (#12).

Meanwhile, the European Commission was gradually changing its position. It started with Mr. Adoux from DG IV (Competition), noting that the Commission “(...) favor[s] competing standards but not conflicting standards. (...)” (#13) A few months later, the European Commission wanted “to speed up the standardization of telecommunications solutions which are already available on the market” (#14). This was an important impetus for Tetrapol Forum to re-start the Tetrapol PAS procedure on 21 January 1997. This time, before the voting on the Tetrapol PAS started on April 26 1999, a delegate of the European Commission informed the ETSI General Assembly that the Commission wanted to promote competition and that they should not block this (Interview [1]). Nevertheless, ETSI rejected the Tetrapol PAS, with only 37.5% of the votes in favor. The Presidency of the EU Council interpreted the outcome in a way that matched the Commission’s views: “Until now, attempts to achieve a Common European Standard for radio communication have generally resulted in the adoption of two basic approaches, namely the TETRA *standard* and the TETRAPOL *technology solution*, both of which will now be used in future by the Member-States.” (#15) The Commission hereby recognized Tetrapol as a ‘de facto’ standard.

Over the years, Tetrapol’s status remained a source of confusion which, according to Tetra proponents, was damaging Tetra’s market position:

Members of EP TETRA remain extremely concerned over the continuing confusion in the market place surrounding the status of Tetrapol in the context of an ETSI deliverable. You will be aware of the large investment in the European Standard, Tetra, already made by manufacturers and the TETRA procurement plans of major user organizations and network operators. The confusion is undermining confidence in TETRA and creating damaging uncertainty. (#16)

Brian Oliver, chairman of the ETSI Tetra Committee, noted that although it was clear that ETSI did not want a second standard, the Tetrapol proponents repeatedly tried to label their technology as such in the years 1994 up to 2003 (Interview [5]). A letter that was sent by Tetrapol Forum to Colonel Van

Peer, chair of the Schengen Telecom group, dated 4 December 1995, further fuelled the confusion. Therein Tetrapol Forum called Tetrapol a Publicly Available Specification (PAS) and an open technology. “It respects the seven criteria fixed by the European Commission and approved by ETSI. The technical specifications are already available on request (...) The PAS documents and the report about compliance with the seven criteria are sent to the Director of ETSI to officially confirm that Tetrapol is already a PAS and can be transformed into an ETSI European standard.” The letter implied Commission support and suggested that Tetrapol was already halfway to being accepted by ETSI. Confused, the Schengen Telecom group contacted the European Commission. In response, Mr. Richter (European Commission) denied that ETSI had received the Tetrapol PAS and that an evaluation had already taken place. He noted that the Tetrapol PAS “is clearly in conflict with the criterion four, as its scope is the same as the draft ETSI TETRA ETS, being developed under mandate from the Commission” (...) and that “it is not at all guaranteed that the proposed PAS will be presented at the next [ETSI] Technical Assembly.” (#17) He ended his letter sincerely regretting that Tetrapol Forum’s letter did not correctly represent known public facts.

Discrediting ETSI

Uncertainty-enhancing were also Tetrapol Forum’s references to ETSI’s lack of integrity. ETSI’s “anti-competitive practices (...) sought systematically to prevent TETRAPOL from gaining [European] recognition (...)” (#21). Certain members were colluding “to jeopardize the chances of the PAS application getting a fair treatment.” (#22) More subtly, the chairman of Tetrapol Forum wrote the following in a letter to the ETSI secretary-general with a cc to the Commission:

(...) TETRAPOL Forum suggested that ETSI proceed with a thorough and objective examination of the complementary issues between the two technologies. In this respect, it is our view that the evaluation process cannot be based on anti-competitive criteria (such as a total ban on any overlap between a PAS application and an existing or in development ETSI standard) but must be market-oriented. In particular, the standardization process cannot be allowed to result in the unnecessary elimination of a widely used and complementary technology in this particular field of telecommunications whereas, like in other telecommunications fields, valid solutions can be found that permit the continued coexistence of partly overlapping standards. (...) I am sure you will understand that TETRAPOL Forum cannot – and will not accept being involved in a standardization process unless it is fair, objective and transparent and that no unnecessary restrictions are imposed. (#23)

By discrediting ETSI, doubts were cast on its decision not to support Tetrapol, on the quality of the Tetra standard, and on the demand for and market uptake of ETSI standards.

Law Suits

Law suits took place and legal threats were made. Countries like the Netherlands, Belgium and the UK explicitly favored Tetra over Tetrapol in their procurement policy. Matra viewed this as hindering free market competition. It objected to the way the UK Home Office had handled the public procurement process for its national Public Safety Radio Communications Project (later PSRC-S or “Airwave”) for emergency services in 1998 (#24). The UK had issued an open tender but had not considered bids from non-Tetra companies, according to Gary Spicks, journalist for Communications Week International. The following quote from a letter of the UK Home Office to ETSI confirms this:

The UK Home Office is currently in a procurement process for the Public Safety Radio Communications Project (PSRCP) which will provide the national, next generation emergency service radio system for England, Wales and Scotland. PSRCP is a billion UK pound procurement carried out through rigorous application of EU Procurement Procedures. Accordingly, the procurement specifies the open European Standard that meets the requirements and that standard is TETRA. (...) The introduction of a competing ETSI standard would lead to market fragmentation, reduced manufacturing volumes, increased unit costs and reduced manufacturer viability, as well as loss of interoperability and reduced choice of terminal suppliers for users. (#25)

The Home Office chose the BT-led consortium Quadrant, which included Nokia Oyj and Motorola, “to carry out a pilot study, which if successful is likely to lead to the full contract worth 1.5- 2 billion (...) over 15 years” (#26). Matra felt that “Tetrapol manufacturers were excluded from this competition on the grounds that Tetrapol was not an ETSI standard” (#27) and started a legal case against the UK Home Office. However, Matra’s case was rejected on the ground that Matra had been too late to complain (Interview [4], UK Home Office). Whether the lawsuits and legal references (#29) were called for or not, they made people wary and cautious.

Perceived FUD Behavior and the Market

The market for European public safety networks was slow to develop. A notable cause for delay was the scope creep and increasing complexity of standards committee work in ETSI. Over the years the targeted market shifted and new requirements (e.g. of Schengen Telecom) were added (Bekkers, 2001). In addition, the emergence of a rival incompatible technology also held back market development (Shapiro, 1999). Matra, the owner of the ‘proven technology’, was severely side-tracked by ETSI’s Tetra initiative, while Matra’s Tetra-6 and two Tetrapol-PAS initiatives heavily side-tracked ETSI’s Tetra committee and delayed the standard’s publication. The competing technologies created uncertainty among suppliers. The implication for roaming between networks was unclear, and the fear was that the market would become too small to compete (Bekkers, 2001, pp. 401-402). Many suppliers postponed investing in commercial Tetra equipment for fear of being stuck with the ‘losing’ technology and/or needing to support both Tetra and Tetrapol. For the same reason, also users postponed adopting one of the digital technologies.

Table 2. Perceived FUD strategies in the Tetra – Tetrapol standards war

Behavior	Example	Affect
Procedural Pre-announcement	<ul style="list-style-type: none"> Announcement of Tetrapol undergoing ETSI’s PAS process 	<ul style="list-style-type: none"> Creating Uncertainty
Similar Naming	<ul style="list-style-type: none"> Tetra 6 and Tetra 25 Tetra and Tetrapol 	<ul style="list-style-type: none"> Creating Confusion
Terminology Re-interpretation	<ul style="list-style-type: none"> PAS or P.A.S. standard or technical specification 	<ul style="list-style-type: none"> Creating Confusion
Discrediting	<ul style="list-style-type: none"> Discrediting ETSI’s workings, standards and standards’ uptake 	<ul style="list-style-type: none"> Raising Doubt
Misrepresentation	<ul style="list-style-type: none"> Inaccurate account of events 	<ul style="list-style-type: none"> Raising Doubt
Legal Action or Pre-announcement thereof	<ul style="list-style-type: none"> About breach of EU procedures 	<ul style="list-style-type: none"> Creating Fear Creating Uncertainty

Market uncertainty was further fuelled and prolonged by the use of FUD strategies in the settings of standardization and government politics. The following behavior was perceived as such (see Table 2):

- Procedural pre-announcement (e.g., announcement that a technology will enter a standards process which will heighten its status)
- Similar naming (e.g., renaming a technology in a way that creates a direct - assumed positive - association with another technology)
- Terminology reinterpretation (e.g., reinterpreting a term in a different – often unintended – way);

- Discrediting (e.g., raising doubts about a competitor's integrity)
- Misrepresentation (e.g., inaccurate accounts)
- Legal action or pre-announcement thereof (e.g., about possible incorrect reference to standards in public procurement)

The delays in standardization caused by this behavior made it difficult to create momentum for the Tetra market. On ETSI's side, extra time and effort was needed to respond to disinformation and incorrect claims, and to restore trust in the Tetra standard, its standard process and its market expectations.

CONCLUSION

In this chapter a step has been taken towards a more systematic study of FUD strategies. A key element therein has been to redefine Pfaffenberger's notion of 'FUD as intended' as 'FUD as affected' to emphasize the subjective, perceived nature of FUD. This conceptual shift has immediate bearing on our answers to the three research questions and our recommendations to corporate standardization managers and Standards Development Organizations (SDOs).

Research Questions

Regarding the way (perceived) *FUD strategies may manifest themselves* in committee standards wars, FUD behavior observed in de facto standards wars also occurs in committee standards wars. Compare, for example, product pre-announcements in de facto standards wars with procedural pre-announcements in the case study, a FUD strategy specific for committee standards wars. Other FUD strategies that emerge from the study are similar naming, terminology reinterpretation, discrediting, misrepresentation and legal action (pre-announced or effectuated). The FUD strategies we have observed are case-bound and may not be evident in other committee standards wars. But the case is rich in examples, and, while new case studies are likely to extend our list of (perceived) FUD strategies, this initial list serves to help corporate standardization managers to recognize them. In the case study, behavior associated with these FUD strategies led to confusion, uncertainty, fear and doubt. Whether the FUD that was created ('FUD as affected') was also intended, was sometimes confirmed by the stakeholders themselves. In other instances, behavior perceived as such may not have been intended. That is, unfairness is attributed to 'unintended FUD'. One may ask oneself if it is at all relevant to correctly attribute intentionality to behavior resulting in FUD since, one way or the other, the outcome is the same. Our expectation is that in most situations it is relevant. The case illustrates how unsettling FUD strategies can be if perceived as intentional by the receiving end. The documents and interviews testify that ETSI standardizers often felt cornered and forced to respond. Perceived intentionality appears to entrench positions, reduce willingness to take the opponent's perspective, narrow down perceived options for counter-strategies, hinder the identification of common interests, and cloud views on partial, intermediate and/or long-term compromises. In short, company standardizers run the risk of retaliating with defensive counter-strategies that are ineffective and escalate a standards war. That is, incorrect attribution of intentionality can be self-defeating. In order to react in a more effective and measured manner, corporate standardization managers benefit from realizing that what may seem as a predatory strategy may be seen by others as a necessary survival strategy in a highly competitive market. To recall an earlier quote, "When it comes to standards wars, traditional principles of strategy, while helpful, are not enough" (Shapiro, 1999). A better understanding of the context in which (perceived) FUD strategies emerge reduces the chance of attributing unfairness to 'unintended FUD'.

Regarding the second research question, the *context in which FUD strategies may emerge*, FUD strategies find a fertile ground in standards wars. To recapitulate, standards wars involve incompatible rival technologies (i.e., which cannot exploit each other's externalities) in highly competitive markets (i.e., high stakes). In our case study, it started out as a war between a company with an existing market and an implemented technology, on the one hand, and a group of stakeholders that wanted to enter a

new market and standardize a new rival technology, on the other. The former company feared being ousted out of the market and was perceived to use unfair FUD strategies.

Initially, both warring parties had IPRs on competing technologies and therefore incentives to exploit them. The targeted market was relatively specialized but profitable, which intensified competition.

One party had a clear first-mover advantage (i.e., expertise and implementation experience) and high vested interests. Several large companies were involved that also produced for other markets (i.e. they ran businesses that were partly independent of the area standardized) *and* could survive a protracted standards war. Influential customer-users were involved, national government agencies, with high stakes in standardization (e.g. high sunk costs and crucial interests in public safety) and some with clear links to their national industry (i.e., standardizing companies).

The literature on standards wars and the case study suggest that the risk of resorting to FUD strategies will be high in highly competitive markets and standards wars. It escalates where a company's survival is at stake. Comparative research is needed to determine whether standards wars that show similar characteristics also show similar predatory behavior.

With respect to the third research question, *how do FUD strategies affect the dynamics of technology wars in committee standardization?*, the case illustrates that perceived FUD increases the number and accelerates the succession of conflicts. It polarizes and entrenches positions. It leads to competing standards and technology solutions, and to market fragmentation.

To deepen the discussion, the distinction between using FUD strategies in de facto and committee standards wars is likely to be relevant here. In the light of game theory (Axelrod, 1984), committee standardization can be viewed as a game with multiple rounds. The (formal) aim of the game is ongoing market coordination among stakeholders. Once a standard has been finalized, stakeholders are likely to meet again at a later stage to revise the standard or develop standards in adjoining areas.

Using FUD strategies intentionally will affect a company's reputation and influence future standardization negotiations. This issue may be less acute in de facto standards wars, where coordination is not at stake and the game may end after one round. In these situations, intentional FUD and other short-term predatory strategies may go unpunished, but such a 'scorched earth' strategy most likely precludes future collaboration.

Recommendations

Why is it important for corporate standardization managers to better understand, recognize and address (perceived) FUD strategies? Because FUD strategies typically escalate and prolong standards wars. This, in turn, increases market uncertainty and possibly leads to competing standards. Corporate standardization managers will usually want to avoid these consequences. In economic terms, uncertainty about the outcome of a standards war means that producers will try to postpone investments for fear of investing in a losing system and having to write off sunk costs (i.e., costs that are specific and irreversible and therefore cannot be retrieved). For the same reasons consumers will postpone their purchases. The market will stagnate. Moreover, there is a high risk of ending up with functionally equivalent, competing standards that fragment the market. Smaller, fragmented markets are more risky for producers to enter and less worthwhile (decreased economies of scale). Competing standards also create difficulties for consumers, here: the emergency services (e.g. reduced market transparency, lack of interoperability and high transaction costs such as switching costs). (Egyedi, 2014)

Corporate standardization managers and user agencies, which are or may be on the receiving end of FUD strategies, should therefore be aware of what they entail and how they work. Insight in the context in which (intentional) FUD strategies are more likely to emerge, may aid in anticipating and precluding their emergence. Early analysis and warning allows stakeholders to explore solutions that transgress an imminent committee standards war. Is there a possibility for adequately addressing the vested interests of a company whose survival may be at stake? Can the company be compensated by means of intellectual property or other commercial assets? Or by government contracts in other areas? Is it feasible to outline long-term technology convergence and a standards trajectory? Could it be that the life-cycle of the company's and the competitor's products are so short that they will soon be bypassed by a new technology anyway?

Once FUD strategies are perceived to be used, counter-strategies will come into play. As noted, those on the receiving end of FUD need to be cautious about too easily attributing intentionality and remain aware of the existence of different perspectives and interests. 'FUD as perceived' may –but need not – equal 'FUD as intended'. FUD entrenches and polarizes positions. It deepens conflicts. Once this happens, both the contemplated range of solutions and the room for negotiation tend to narrow down to short-term defensive company interests, if our case is anything to go by. Whether there is leeway for more diverse responses requires more elaborate research.

The case study illustrates that effective counter-strategies against FUD created by, for example, similar naming, misrepresentation and legal threats are difficult to devise. This picture also emerges from descriptions of de facto standards wars. In committee standards wars, one may presume that a FUD strategy like discrediting an SDO is less likely if SDOs have a strong reputation. Transparent standards procedures and clear terminology may partly buttress an SDO against targeted misuse ('terminology reinterpretation'). To our knowledge, no studies exist that address FUD counter-strategies in a systematic way, let alone strategies that down-scale standards wars and thus reduce their impact on technology development and markets. In this area more research is direly needed.

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REFERENCES

- Axelrod, R. (1984). *The evolution of Cooperation*. USA: Basic Books.
- Bayus, B. L., Jain, S., & Rao, A. G. (2001). Truth or Consequences: An Analysis of Vaporware and New Product Announcements *Journal of Marketing Research* 38(1), 3-13.
- Bekkers, R. (2001). *Mobile Telecommunication Standards. GSM, UMTS, Tetra and Hermes*. Boston, London: Artech House.
- Besen, S. M., & Farrell, J. (1991). The role of the ITU in standardization : Pre-eminence, impotence or rubber stamp? *Telecommunications Policy*, 15(4), 311-321.
- David, P. A. (1987). Some New Standards for the Economics of Standardization in the Information Age. In P. Dasgupta & P. Stoneman (Eds.), *Economic Policy and Technological Performance* (pp. 206-239). Stanford: Cambridge University Press.
- Dranove, D., & Gandal, N. (2003). The DVD vs. DIVX Standard War: Empirical Evidence of Vaporware. *Journal of Economics and Management Strategy*, 12, 363–386.
- Egyedi, T. M. (2001). Why Java™ was -not- standardized twice. *Computer Standards & Interfaces*, 23(4), 253-265.
- Egyedi, T. (2014). The Impact of Competing Standards: On Innovation and Interoperability for E-government. *PIK - Praxis der Informationsverarbeitung und Kommunikation*, 37(3), 211-215.
- Egyedi, T.M., & Hawkins, R. (2010). Standards Consortia. In W. Hesser, A.J. Feilzer & H.J. de Vries (Eds.), *Standardisation in Companies and Markets* (3rd ed.) (pp. 443- 490). Hamburg: Helmut Schmidt University.
- Farrell, J., & Saloner, G. (1985). Standardization, Compatibility and Innovation. *RAND Journal of Economics*, 16, 70-83.
- Farrell, J., & Saloner, G. (1986). Installed base and compatibility: innovation, product preannouncements, and predation. *American Economic Review*, 76, 943–954.
- Gallagher, S. R. (2012). The battle of the blue laser DVDs: The significance of corporate strategy in standards battles. *Technovation*, 32(2), 90-98.
- Gauch, S. (2008). + vs. – , Dynamics and effects of competing standards of recordable DVD media In T. M. Egyedi & K. Blind (Eds.), *The dynamics of standards* (pp. 47-67). Cheltenham, UK: Edward Elgar.

- Haan, M. A. (2003). Vaporware as a Means of Entry Deterrence. *The Journal of Industrial Economics* 3, 345-358.
- Jakobs, K. (2008). The IEEE 802.11 WLAN installation at RWTH Aachen University: A case of voluntary vendor lock-in. In T. M. Egyedi & K. Blind (Eds.), *The dynamics of standards* (pp. 99-116). Cheltenham, UK: Edward Elgar.
- Lee, H., & Oh, S. (2006). A standards war waged by a developing country: Understanding international standard setting from the actor-network perspective. *Journal of Strategic Information Systems*, 15, 177–195.
- Oshri, I., & Weeber, C. (2006). Cooperation and Competition Standards-Setting Activities in the Digitization Era: The Case of Wireless Information Devices. *Technology Analysis & Strategic Management*, 18(2), 265–283.
- Pfaffenberger, B. (2000). The Rhetoric of Dread: Fear, Uncertainty, and Doubt (FUD) in Information Technology Marketing. *Knowledge, Technology & Policy*, 13(3), 78-92.
- Raymond, E. (2009). <http://www.catb.org/~esr/jargon/html/F/FUD.html>, accessed 16 May 2009.
- Schengen. (1990). The Schengen acquis - Convention implementing the Schengen Agreement of 14 June 1985 between the Governments of the States of the Benelux Economic Union, the Federal Republic of Germany and the French Republic on the gradual abolition of checks at their common borders. *Official Journal L 239*, 22/09/2000 P. 0019 – 0062.
- Shapiro, C., & Varian, H. R. (1999). *Information rules - A Strategic Guide to the Network Economy*. Boston: Harvard Business School Press.
- Singh, R. M., & Dahlin, K. B. (2009). *The winner does not take it all: Survival of niche standards*. Paper presented at the EGOS 2009 “The Social Dynamics of Standardization”. Barcelona.
- Vries, H. J. d. (2006). Competing E-Purse Systems: A Standards Battle. *Journal of Cases on Information Technology*, 8(1), 1-15.
- Wegberg, M. v. (2004). Standardization Process of Systems Technologies: Creating a Balance between Competition and Cooperation. *Technology Analysis & Strategic Management*, 16(4), 457-478.
- West, J. (2003). How open is open enough? Melding proprietary and open source platform strategies. *Research Policy*, 32 (7), 1259-1285.
- Williamson, O. (1979). Transactions-Cost Economics: The Governance of Contractual Relations. *Journal of Law and Economics*, 22(2), 233-262.
- Wu, Y., Balasubramanian, S., & Mahajan, V. (2004). When is a Preannounced New Product Likely to be Delayed? *The Journal of Marketing*, 68(2), 101-113.
- Yin, R.K. (2009). *Case Study Research: Design and Methods*(4th ed.).London: Sage.

Interviewees

- [1] Chairman Tetrapol Forum (1991-present), Paris:17-4-2008.
- [2] Former Head of the R&D Department of the Dutch Police, Former chairman of Schengen Telecom, former member of ETSI RES-6 representing the Netherlands, Odijk: 31-5-2006, 29-1-2009.
- [3] Motorola Marketing department, Chairman of ETSI TC Tetra since 2002, Exeter: 26-11-2007.
- [4] UK Home Office, Police ICT department, Chelmsford: 27-11-2007.
- [5] Chairman ETSI Tetra committees between 1991 and 2002, Chelmsford: 27-11-2007.

Archival sources

- # 1. Minutes of a meeting to improve cross-border communication of the police, 11 - 12 July 1989, Bonn-Bad Godesberg, p. 3.
- # 2. Final Report initial phase C2000 (the Dutch Tetra implementation).
- # 3. Letter from ETSI RES to Schengen Telecom Group, 15 November 1994.
- # 4. Letter from A.N. Kent, UK Home Office to K.H. Rosenbrock, ETSI DG, 26-08-1997.
- # 5. Letter O. Lauridsen, September 1995, TETRA MoU Chairman, to M. Bangemann, European Commission.
- # 6. Minutes meeting Schengen Telecom, 9 May 1994, Brussels.
- # 7. Letter from D. Kynaston, Philips, to M. Bangemann, European Commission, 20 September 1995.
- # 8. Note from the French Delegation to WG Telecommunications, 16 October 1996
- # 9. Letter from the chair and vice-chair of Tetrapol Forum to the ETSI DG, K.H. Rosenbrock, 9-10-1996.
- # 10. Committee document, Motorola, J. Jensen, 14 November 1995.
- # 11. International consultation, Police, NL, 24-11-1997, p.2 [translated from Dutch].
- # 12. Letter from H. Borgonjen, 14-10-1996.
- # 13. Minutes of 23/24 October meeting from J. Jensen (Motorola, MoU) to H. Borgonjen and others, 25-10-1996, p. 4.
- # 14. Letter from H. Azémard (Tetrapol Forum) to K-H. Rosenbrock (ETSI), January 24, 1997.
- # 15. Note from Presidency [Council of the European Union] to Police Cooperation working group, 16 November 1999 (*italics added*)).
- # 16. "TETRA- the one and only European standard", press release Nokia/Tetra, 16-9-1997.
- # 17. Letter from Mr. Richter, European Commission, to Schengen Telecom group, 15-12-1995.
- # 21. Letter from H. Azémard, Chairman Tetrapol Forum to F. Chumbinho, chairman of the Schengen Telecom Group, 2-4-1997.
- # 22. Letter from H. Azémard, Chairman Tetrapol Forum to K.H. Rosenbrock (ETSI), 08-09-1997.
- # 23. Letter from H. Azémard, Chairman Tetrapol Forum to K.H. Rosenbrock, Secretary-General of ETSI), 08-09-1997.
- # 24. TETRA MoU document, Why is the Tetrapol PAS application contentious?, December 1998.
- # 25. Letter from the UK Home Office to K.H. Rosenbrock, ETSI DG, 26-08-1997.
- # 26. Letter from the UK Home Office to K.H. Rosenbrock, ETSI DG, 26-08-1997.
- # 27. Cogent Defence System's Response to The Radio Spectrum Review Consultation Paper, 2001, p. 6.
- # 29. Letter from the chair and vice-chair of Tetrapol Forum to the ETSI DG, K.H. Rosenbrock, 9-10-1996.
- #30. Letter from M. Bangemann, member of the EC, to H. Dijkstal, Dutch Minister of the Interior, 29 April 1998.
- #31. Letter from H. Azémard, chairman of Tetrapol to the ETSI Technical Assembly, 11-10-1996, ETSI/TA25(96)TD24.

KEY TERMS AND DEFINITIONS

Affect: A psychological term for feeling, experience or emotion.

Committee Standardization: The process of developing standards in technical committees of formal standards bodies, consortia, professional organizations, (inter)governmental agencies, etc.

Committee Standards: Standards that have been created and documented for common and repeated use.

De Facto Standards: Popular products, technologies, etc. They dominate the market. Similar to popular committee standards (e.g. A4 paper format ISO 216 or Wifi IEEE 802.11g), de facto standards function as points of reference for consumers and producers; but, unlike committee standards, they were not created for that purpose.

FUD: Fear, Uncertainty and Doubt. Most often used in the context of someone 'creating FUD'.

FUD Strategy in Standardization: A market strategy *perceived* to be designed to create unease among competitors and raise concern among users about the consequences of selecting a competitor's standard, by exerting pressure - psychological, legal or otherwise – and disseminating negative and/or incorrect information about the standard, the standards process or the standard's likely market uptake, as a result of which the credibility of the competitor and/or the competing standard is undermined.

Predatory Strategies: Aggressive market strategies intended to undermine a competitor's position.

PAS: Publicly Available Specification, a term used by standards bodies for a specific, accelerated standards 'development' trajectory. The procedure allows market-relevant and mature specifications, which were developed outside of the standards body, to become a formally recognized standard.^{vi}

Product Preannouncements: A formal and deliberate communication that releases information about a product well in advance of the product's actual introduction (Wu, 2004).

Standards war: A situation in which two competing parties with incompatible standards (i.e. committee or de facto standards) and very high stakes fight for a dominant market share.

ENDNOTES

ⁱ Archival sources are indicated by hashtag numbers: #1 etc.. They are listed at the end of the chapter.

ⁱⁱ I.e., archive of the Schengen Telecom group (personal archive of H. Borgonjen), archives of the Dutch Ministry of the Interior on C2000, and the ETSI archive. They include policy reports, correspondence and minutes of meetings.

ⁱⁱⁱ Interviewees are indicated by straight brackets and numbered: [1] etc. They are listed at the end of the chapter.

^{iv} NB: Research question (iii) about the conditions under which FUD strategies arise, only addresses situations in which FUD-raising behavior was self-reported as intended and perceived.

^v Two days later a letter was sent by the chairman of Tetrapol to the ETSI Technical Assembly noting that “TETRAPOL remains a Publicly Available Specification; the last sections will be made public this coming December (...) (#31)

^{vi} For ETSI, see <http://www.etsi.org/about/what-we-do/publicly-available-specifications-pas>