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'Cross-talking':

Signal and noise in the history of Greek telecommunications

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Abstract

Doubling (and further multiplying) the signal-carrying capacity of existing lines without building new lines started with the telegraph and continues with present day telecommunications technology. Conceptual discontinuity has obscured the similarity of telecommunications circuits known as 'duplex' (and 'multiplex' in general), 'superimposed', 'plus-plus', 'carrier', etc. The use of different terms to describe contrasting experiences with these circuits -e.g., 'duplex' by headquarters engineers and managers, 'phantoms' by regional technicians and operators- has also obscured this similarity. This similarity has been further obscured by competing diagrammatic and other graphical representation of such circuits by different communities, with the one side placing the emphasis on techniques, profits and double signals, and the other on skills, risks, and noise. According to this second side, telephone phantoms were, for example, chronically susceptible to 'cross-talking', that is to undesirable mixing of more than one conversation. In the past, we have written on aspects of the history of phantoms and related telecommunications techniques in countries from the center of technological developments. In this paper, we present our findings in regards to a telecommunications network from a more peripheral context, that of Greece.

As our hypothesis goes, peripheral technological contexts were more tolerant to cross-talking and other manifestations of telecommunications noise, which resulted in the appropriation of phantom and related techniques in a manner that was significantly different from that of centers of technological development. More specifically, we argue that an overall higher tolerance to noise accentuated the social asymmetries that were usually produced by the differential employment of these techniques within a national telecommunication network. We base this argument on readings of articles published in Greek technical journals, treatises and reports, and on oral interviews of Greek telecommunications pioneers.

Research phases

-A. General case (earlier)

-B. Greek case (ongoing)

Products of phase A (in English)

-Newsletter article: "Artificial Line or Technology as Spectrology," *Antenna* (Newsletter of the *Mercurians*), November 2000,

-Paper: 'Euronets-Eurochannels-Eurovisions' History of Telecommunications 2003 Conference (Zyrich)

-Paper: 'Cross-Connexions' History of Telecommunications 2005 Conference (London)

-Book Chapter (Aristotle Tympas, 'Between Telecommunication Efficiency and Stability: Towards an Historical Approach', in *In-Use Knowledge*, Gerasimos Kouzelis et al. (editors), Peter Lang, Bern, Switzerland, 2005, 197-212).

The phase B research team (www.phs.uoa.gr/ht)

-Sotiris Vernardos, MS in Electronics Engineering

-Michalis Tsarapatsanis, MS in Electrical Engineering (MA in History of Technology, in progress)

-Aristotle Tympas, MS in Chemical Engineering, MA in Technology and Science Policy, Ph.D. in History of Technology

Relevant research projects

-Kapodistrias research grant (University of Athens)

-Pythagoras research grant (Greek state)

-EUROCRIT (Europe Goes Critical Project): 'Inventing Europe' ESF (European Science Foundation) 'Eurocores' research grant (project leader: Arne Kajser)

Research issue of phase A

- Identify and define versions of the technology of reference and produce an historical periodization
- Relate it to technological traditions: feedback (from amplification to filtering), regulation and computation and related terms (control, automation), loading coil and pupinization
- Identify historiographical issues involved

Key concepts-terms identified during phase A (referring to telegraphy and/or telephony and all other forms of telecommunication, wired and/or wireless, over- and/or underground to satellite)

- artificial line (of telecommunications, energy etc)
- duplex (quadraplex, ..., multiplex)
- diplex
- simultaneous
- derived circuit, plus (plus-plus), superimposed
- carrier lines (many versions)
- time, frequency, and/or code multiplexing
- interactive circuit
- enhanced circuit
- ...
- phantom (superphantom, Ghost and Wraith)

Key finding of phase A

The efficiency-stability (balance) trade-off and its various manifestations while trying to have more communication lines without actually building them:

profit vs. risk

intelligent arrangement vs. human skill

designing vs. manufacturing (and repairing)

...

machine vs. worker

...

headquarters (center) vs countryside (periphery)

designer-manager chief engineer vs. wirechief

Analogy with other networks: a more general issue

- Example: the same issue in the railway network

More specific research issues of phase B

- Where such circuits used in a country like Greece and which ones? CRITICAL PERCENTAGE (ANALOGY WITH ELECTRIFICATION)
- Where they considered state-of-the art or backwards technology (or both, depending on the time)? Where they imported? From where? Adjustment in use? Were they new or where they recycled? German (1930s) and American (1950s) influences.
- Were Greeks more tolerant to instability and the associated problems (cross-talking, noise in general)? The same in all historical periods?
- Opening up the network 'black-box': Did the use of these circuits produce network asymmetries? RELATION BETWEEN TECHNICAL AND SOCIAL ASSYMETRIES (E.G., NETWORK ASSYMETRY AND DRAMATIC AND RAPID URBANIZATION OF GREECE). DID CROSS-TALKING AFFECT ALL GREEKS EQUALLY?
- Differentiation from the Greek mountains to the Greek islands (with Athens in between): a geography and technology relationship issue
- The effect of the use of such circuits on the relationship between the development of internal (within Greece) and external (connection to Europe) links of the network amidst political and border fluidity (from post-Ottoman Balkans to Cold War Balkans)—link to the EUROCRIT project (the Athens-Thessaloniki-Beograd connection interwar example)
- HOW TO MEASURE CROSS-TALKING--ESPECIALLY ITS REGIONAL DIFFERENTIATION WITHIN GREECE AND BETWEEN GREECE AND THE REST OF EUROPE SYNCHRONICALLY? HOW TO MEASURE ITS DIACHRONIC DIFFERENTIATION?
- Terms and concepts for such circuits and the cross-talking phenomenon [late interwar concepts: cross-talking (English), nebesprechen (German), diaphonie (French), diaphonia (Greek)]

Research sources and strategies

1. Engineering and other technical archives and interviews, treatises and articles (several articles in *Works and Technical Chronicles*--the journals of the Technical Chamber of Greece)
2. Management and economics literature: chapters systematically devoted to what was called "intensive exploitation" of the network
3. Newspaper and popular journals (link to my department's research emphasis on 'Science and Technology in the Public Domain')

How we try to link and compare 1 and 3