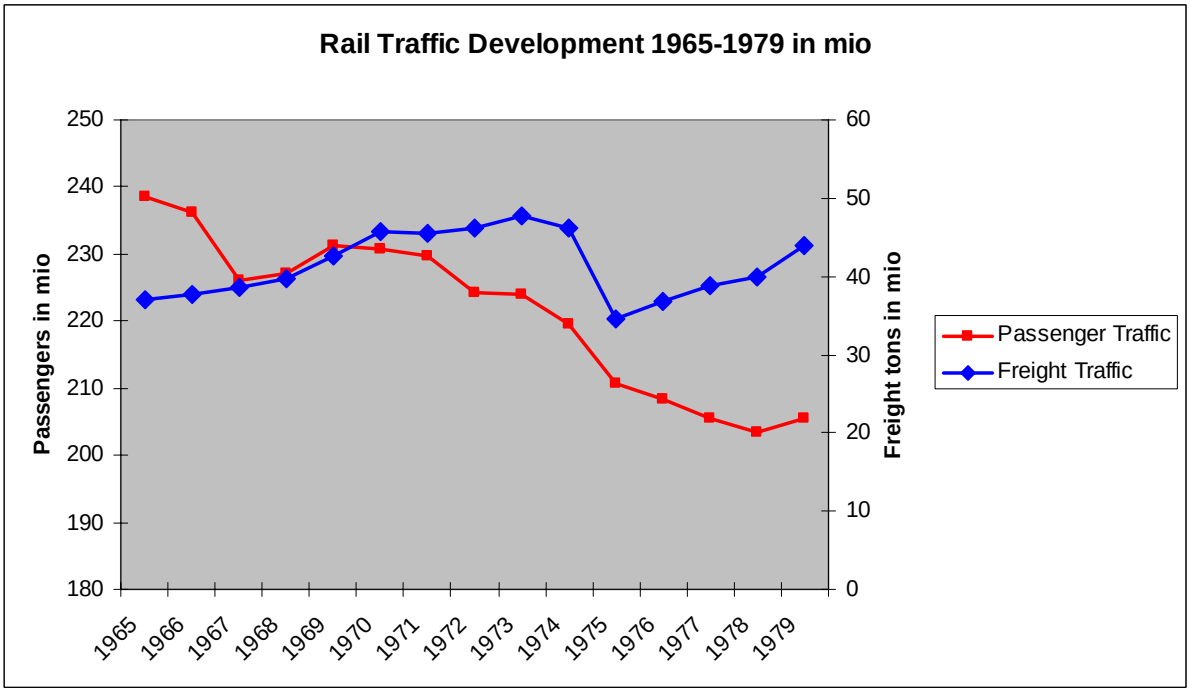

Source: Bundesamt für Statistik (1985), Schweizerische Verkehrsstatistik.

The Swiss path to the “Railway of the Future” (1960s to 2000)

Contributions towards a history of technology of the Swiss Federal Railways

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The Swiss path to the "Railway of the Future" (1960s to 2000) Contributions towards a history of technology of the Swiss Federal Railways

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Abstract

From 1969 onwards, the management of Swiss Federal Railways (SBB)[1] promoted the constructing of new and straighter railway lines allowing high-speed rail traffic. The project was called „New Main Railway Traverses“ (NHT)[2] and was designed in accordance with the European infrastructure guidelines concerning the future of the railways or the „Railway of the Future“, as the executives of the International Railway Federation (UIC) put it. But while in other European countries high-speed trains were put into service from 1981 onwards, SBB buried their speed vision in the early 1980s. *“Electronics instead of concrete!“* became the leitmotif for a modified strategy, which focussed on more „software“-oriented innovations like the cyclic timetable. The integrated fixed interval type of a cyclic timetable launched by a group of young SBB engineers in 1972 was compatible with new tracks and higher speeds and became the core of the later “Rail 2000”-project. The paper focuses on the contemporary innovation paradigms, with which European and Swiss railways aimed at competing with road and air traffic: cybernetics and automation, high-speed and marketing. Different reasons for the development of “Rail 2000” out of the abandoned NHT-project are evaluated and different historico-sociological concepts like agency, discourse and contingency are exemplified. The paper reflects a synopsis of an ongoing PhD-project of the author in the field of the history of technology, business history and social history.

All quoted sources and statements were originally written or enounced in German and have been translated to English by the author of this paper.

Keywords

Swiss Federal Railways (SBB) – integrated fixed interval timetable („Taktfahrplan“) – cyclic timetable – Rail 2000 – New Main Rail Traverses (NHT) – history of technology – business history – service innovation – system innovation – cybernetics – automation

[1] SBB = Schweizerische Bundesbahnen

[2] NHT = Neue Haupttransversalen

1. Introduction: different genealogies

The "Taktfahrplan" [Swiss integrated fixed interval timetable][3] was developed in the years 1971-1972 by a team led by the charismatic young engineer Samuel Stähli. For in 1969, Stähli who already as a boy had conceived a systematic timetable for his model railway had presented his superiors a first draft for a systematic timetable in vain. The rhythmic-timetable-team was part of a so-called "Spinnerclub"[4] where young academicians of the Swiss Federal Railways enjoyed freedom to criticize and to venture new ideas some of which were perceived as daring, like the "Taktfahrplan". It took SBB ten years – until May 1982 - to introduce this innovation.[5]

To say, the "Taktfahrplan" got developed by the "Spinnerclub" is a myth. Stähli was probably sent to Holland to study the Dutch cyclic timetable by the SBB directors general. Stähli knew the head of the Dutch timetable department well.[6]

Of course, the "Taktfahrplan" is an innovation. But, let's face it, actually it's not much more than a copy of the cyclic timetable already existing in the commuter trains and of the model at the Dutch Railways. (…) Max Rietmann whom nobody remembers nowadays, carried out the "Taktfahrplan".[7]

As a young secretary general at SBB (…), I charged a renowned PR-agency to work out a communication strategy for the New Alpine Rail Traverses (NHT). In their report, the PR-agency arrived to the remarkable conclusion that we should not argue for the NHT but instead speak about a better and more attractive supply from the part of the railways. The term "NHT" shouldn't be used anymore. At first, this advice meant breaking a taboo, but became very soon the catalyst for an intense internal debate.[8]

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[3] I adopt here the term used by Peeters and Lichensteig (1990) who held that the Swiss timetable is not a cyclic timetable concept, but rather an "integrated fixed interval timetable". See: Leon W. Peeters (2003), Cyclic Railway Timetable Optimization (Optimalisatje von cyclische spoorwegendienstregelingen: Proefschrift). Rotterdam, p. 12.

[4] The German term "Spinnerclub" expresses the notion of a 'madcups' club' or a 'spinning club', as the verb "spinnen" means to spin/yarn, and to be mad.

[5] Resumed opinion of the picture friends of the late Samuel Stähli and members of the "Spinnerclub" design.

[6] Opinion uttered in one of the interviews made by G. Hürlimann for this research.

[7] SBB CEO Benedikt Weibel in his speech at the occasion of presenting the book "Mehr Zug für die Schweiz: Die Bahn-2000-Story" in Zurich, 14.10.2004.

[8] Benedikt Weibel, Von der Schnellbahn zur S-Bahn Schweiz, Rede an der Einweihungsfeier der Bahn-2000-Neubaustrecke Mattstetten-Rothrist, 21.10.2004.

I heard that Rail 2000 is based on ideas of the Swiss Traffic and Environmental Club.[9]

Two recent railway innovations with varying genealogies: What may be irrelevant for the future-oriented traffic planner or engineer is one of the historian's main objectives: to find out, how "it really *could have been*". By using the subjunctive verb, I have endowed the programmatic claim of German historian Leopold von Ranke of how to proceed in the science of history with a slight subversive note. Actually, modern historiography is as far away from the 19th century historicism of Ranke as are modern train control systems from the mechanical semaphore signals. Still, the basic motivation remains: to guarantee traffic safety in one case and to reconstruct the past whose product is the present in the other. Let's go back to the initial array of historical interpretations: Four of them are summarized statements of contemporary or current SBB agents. Two of them were made in interviews for this current research. Two other statements are taken from recent speeches of the SBB CEO in inauguration ceremonies for Rail 2000. And one opinion was uttered during a conference where this research project had been presented. What is a historian supposed to do with such varying genealogies? For an economist, this would probably be clear-cut case: the individual agents owe their restricted and one-sided views to incomplete information.

Though, what in an economical perspective may seem to be a mere quantitative deficiency in need of quick remedy, is a highly valuable analytical setting for a historical and sociological interpretation: it sheds light on the individual narrators' interpretative patterns which govern the memory process. When we are collecting historicizing testimonials like the ones quoted, we can identify three main modes of speaking about the past: 1) a specific interpretation of the past makes sense to the narrator; 2) the narrator wants a specific interpretation to make sense to the public; 3) both. In spite of their heterogeneity, different interpretations of one and the same event or development can be fruitful for the reconstruction of the past because they furnish this process with a useful complexity – with a wide angle-perspective. The progress of growing awareness resulting from working with the sources will supply evidence of the plausibility and relevance of the different narrations. Proceeding this way, the researcher can avoid the true/false-dichotomy, which applies to computers, but rarely to complex social and socio-technical interaction processes.

If we focus on the cyclic timetable, our question can be: Which factors made it for SBB agents attractive to develop a cyclic timetable in the 1970s? And on which socio-technical and business hypothesis was such a timetable system based?

[9] Intervention made by a participant of a conference about business history in Neuchâtel, 13.11.2004.

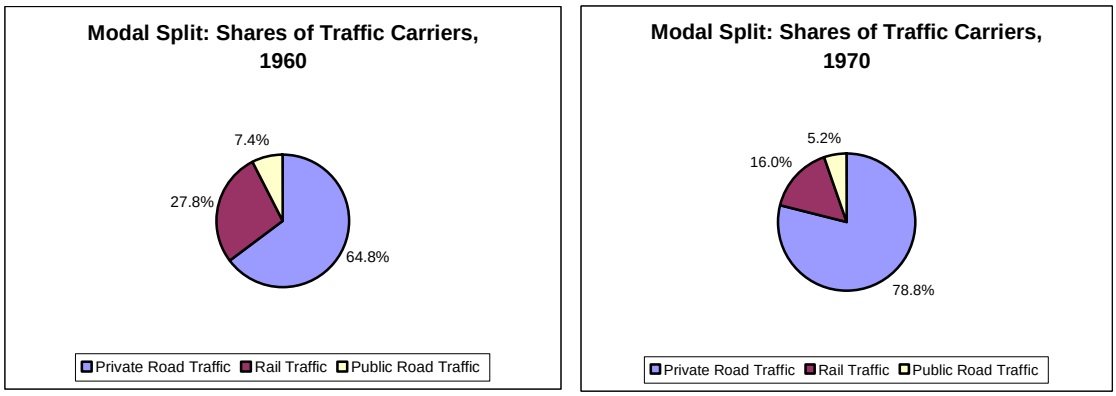
2. The exigency to compete and to innovate

2.1 Transportation monopoly lost – and competition intensified

In their brochure "Taktfahrplan Schweiz: A New Passenger-Rail Concept" from June 1972, the three authors took an unusual line by putting the blame for the crisis SBB went through mainly on the railway company itself and by insisting on the need for a thorough market and customer orientation: "The railways' share in the total passenger traffic has been diminishing for years. There are several reasons for this. One of the major reasons is the actual train service, which does not meet today's customer wishes anymore. The main ingredient of this service is the timetable (…)."[10]

The following figure illustrates the dramatic lost of the railways' shares in the passenger traffic modal share:

Figure 2 Modal Split: Shares of Road and Rail Traffic, 1960 and 1970



Source: Bundesamt für Statistik (1985), Schweizerische Verkehrsstatistik, p. 116.

Given their business conditions – high sunk costs, minimal margins, expenditures which were growing faster than the returns, legal obligations and restrictions on their business autonomy -, SBB needed substantial gains at the expense of other traffic carriers in order not to slide into the deficit zone again. But exactly this happened in 1971.

After the lost of the de-facto transportation monopoly, we can therefore identify *the need to compete with road and air traffic as the paradigm*, which structures all innovation efforts in

[10] Jean-Pierre Berthouzoz, Hans Meiner, Samuel Stähli, Taktfahrplan Schweiz: Ein neues Reisezugkonzept, Choindez, 16. Juni 1972, p. 1.

the last 30-40 years of SBB's history. The highly indebted company had experienced a similar situation in den 1930s and 1940s. Those days, attempts to regulate and coordinate the different traffic carriers, which would have protected the railways against the road goods traffic, were declined in several popular votes.[11] In the face of these political preferences of the voters, passengers and potential car drivers, SBB and their lobby restrained themselves from fighting against the road competition. Politics decided to drive double-tracked into the future: on the rail and on the road. The laws were formulated accordingly. The railway law from 1957 allowed the railways to ask for compensation for the losses resulting from services, which served the public good, but were not profitable like the commuter service with reduced tickets for workers and students or like the piece goods traffic. But until 1961, the law inhibited SBB to invest more money for renewal, purchasing or building than they amortized annually. The vast majority vote in 1958 in favour of constructing motorways in Switzerland fostered the implicit task sharing between rail and road: mass cargo, workers, students, old age pensioners and tourists took the railway, the booming middle class though approached its prosperous future in their private cars.

Twenty years earlier, the federal government had declined projects for building motorways following the example of the "Autobahnen" in Nazi-Germany. Such expressways, the government stated, counteracted the requirements of the Swiss national defence and tourism policy.[12] Wolfgang Schivelbusch reminded of the fact that the motorways transmitted the advantages of the rail track, a physically ideal driveway with low resistance, onto the road.[13] But in the 1950s, circumstances changed: road traffic became the role model for railways: by 1956, the European railway lobby claimed for the legal possibility to cut off not profitable commuter train services and replace them by busses.[14]

In the German railway technology, a path towards speed records and high-speed trains concepts existed since the early 20th century.[15] But the chase after lost traffic shares by imitating motorways and air traffic only began in the 1960s. Reducing the travel time by

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[11] Verkehrsteilungsgesetz 1935, Gütertransportinitiative 1946, Auto-Transportordnung 1951.

[12] Michael Ackermann (1991), Konzepte und Entscheidungen in der Planung der schweizerischen Nationalstrassen von 1927 bis 1961. Bern etc., p. 86.

[13] Wolfgang Schivelbusch (1979), Geschichte der Eisenbahnreise: zur Industrialisierung von Raum und Zeit im 19. Jahrhundert. Frankfurt a.M. etc. 1979, p. 25f.

[14] UIC (January 1956), Das Problem der Finanzlage der Eisenbahnen.

[15] Stephan Zeilinger (2003), Wettfahrt auf der Schiene: Die Entwicklung von Hochgeschwindigkeitszügen im europäischen Vergleich. Frankfurt/New York.

raising the travel speed became a major instrument to compete and a thorough drive for innovation. The Japanese Railways in 1964 fixed the standard, when they inaugurated the first high-speed train system on a new line between Tokyo and Osaka based on the conventional rail/track-technology. The Shinkansen-system disentangled high- and low-speed-trains and made the building of new, specially designed tracks for high-speed necessary. "The Japanese National Railways can be proud to have created the first part of the railway of the future with their new Tokaïdo-Line", Louis Armand, secretary general of the International Railway Federation (UIC) and former president of the French Railways (SNCF) described his impressions from the inauguration of Shinkansen he had witnessed.[16] The idea of a "Railway of the Future" became part of the terminological inventory of the international and Swiss railway agents. "Railway modernization" became another leitmotif and contained a program to update the rail technology to the progress in technology and speed, design and comfort reached by airplanes and cars. The beginning process of a European unification additionally helped the European railways to put forth a common awareness and a common way of dealing with problems.[17]

1969, after five successful years of Shinkansen, high-speed train plans were publicly announced also in Switzerland. "SBB at 300km/h?" asked the headline of a Bernese newspaper.[18] But SBB agents were well aware of the fact that a reduction of the overall travel time could also be reached by optimizing the operating procedure: more frequent travel times, direct connections and shorter delays for changing to the connecting trains. This approach structured the rhythmic timetable and also Rail 2000. At its core were ideas of systematization and overall planning which formed part of the second means to compete next to the speed paradigm: namely the automation and rationalization paradigm.

2.2 Railway cybernetics and automation

On November 4th of 1963, Hugo Gschwind, head of SBB directors general and president of UIC opened the first symposium on railway cybernetics in Paris. The event lasted ten days and attracted 370 participants from the rail sector, the industry and politics.[19] It was the first

[16] Louis Armand in the Japanese Magazine: „Kotsu Shimbun", extract in: Internationale Eisenbahnnachrichten, Nr. 2/1965, 15.1.1965.

[17] Louis Armand was the first president of the European Atomic Energy Community (Euratom), which in the 1958 "Roman Treaties" constituted one of the founding organs of the later European Community.

[18] "Der Bund", Nr. 287, 8.12.1969, p. 4.

[19] A.I.C.C.F., Kybernetik-Symposium 1963, p. 7-9.

of three conferences on railways and cybernetics, UIC organized between 1963 and 1970 in Paris, Montreal and Tokyo. By the mid-1960s, the cybernetic program and discourse of the Macy conferences had diffused in multiple sectors and sub-disciplines.[20] Some of them were the railway companies, which claimed that the railway system itself constituted an early type of a cybernetic system.[21] It is difficult to find out since when the railway companies perceived these systemically intertwined and interdependent processes and machines as "cybernetic". In 1967, Louis Armand recalled that the railway-cybernetic discourse initially had raised opposition. For many railway professionals the precision embodied by the railways was not compatible with the blurred character of the cybernetic discourse. And for others, UIC-chair Louis Armand hold, the railways system had experienced its own cybernetic revolution long before the advent of electronic computing.[22]

The issue of regulation and control was and is at the core of techno-rationality: How to generate time-optimal and resource-efficient operations in processing? On the level of the economic, political and ideological system the choice traditionally is conceptualized as either the controlling option of the "public and visible hand" of state planning or of the "invisible hand" of a self-regulating market. But even in the antagonistic times of the Cold War, the idea that some entity or mechanism exerts control and initiates processes, which then run regularly, was inherent to both options. The ideas of planning, prognosis and automation are related to each other or rather interrelated. Planning and automation are two major action guidelines in the railway system: Focussing on the infrastructure-side of the railways, the necessity to forecast future traffic demand and to plan the appropriate traffic supply given the long term, costly and environmental consequences of railway construction works attracts attention. This goes also for the micro-level of the railway company, for which the scheduling of the timetable is an essential operation device. If one focuses on the railway as a service provider for freight and passenger traffic, the automation suitability of the "regularized transportation process"[23] is striking, although there are certain limits to rationalization in the sense of replacing human workforce in the practice. The third aspect inherent to large technological systems is their integrative driving force: Already in 1841, French engineer Michel Chevalier

[20] Eric Lettkemann, Martin Meister (2003). Vom Flugabwehrgeschütz zum niedlichen Roboter: Zum Wandel des Kooperation stiftenden Universalismus der Kybernetik.

[21] See: Internationale Eisenbahn-Nachrichten, 7/1967, p. 9: Eisenbahn und Kybernetik.

[22] Louis Armand, Die Kybernetik im Dienst der Eisenbahn, in: Internationale Eisenbahn-Nachrichten, 10/1967, p. 6.

[23] A.P. Petrow (1962), Allgemeine Aspekte der Eisenbahnkybernetik, p. 21.

conceived his vision of a railway system uniting nations and people in a unified Europe.[24] Planning, automation and a trans-European vision including interoperability - these three aspects characterize the railway cybernetics discourse of UIC in the 1960s.

In his opening speech at the symposium in Paris, Louis Armand emphasized that the cybernetic discourse could foster the international solidarity and cooperation amongst the railways.[25] In Armand's view, the traditional cooperation among the railway companies was based on the facts that they used a common technology and renounced to compete against each other – a view which of course neglected the historical development of technological and system differences posing problems to interoperability and forcing the railways to cooperate.[26] The UIC-representative deplored the technical arrearage of the railways, which, unlike aviation, had not profited from the military research of the war years. What a coincidence then, that the railways invoked cybernetics with its roots in the military research programs in order to achieve the technological as well as organization progress necessary for raising their competitiveness. In the railway discourse, "automation" is often used synonymously to "cybernetics" or the term depicts the result of applying cybernetic procedures and machines. "Automation" also appears to be the instrument with which to design the modernized and competitive "Railway of the Future".

In 1965, SBB director general Otto Wichser made clear that an overall, i.e. *cybernetic* usage of electronic data processing for all business areas of SBB was not yet possible. In a conference with the title "Tomorrow's Switzerland" (Die Schweiz von morgen), Wichser presented the newly created division for organization and information technology at SBB. SBB leaders were dependent on the study and calculation of different options in order to be able to cope with the insecure future of the company. Digital computing should provide the necessary data. Until then, computer usage at SBB had been restricted mainly to questions of accountancy, salaries' administration and ticket sales' calculation. Wichser pleaded for a general usage of computer as "parts of closed working systems – called cybernetic systems in more recent terms." For Wichser, the cyber-thinking and cyber-discourse confessed a universally applicable ability to reveal, for he added: "and cybernetics has shown that closed

[24] See Marlies Steinert, Michel Chevalier, (1956), quoted by Dirk van Laak (2004), Jenseits von Knappheit und Gefälle, p. 443f., in: Hartmut Berghoff, Jakob Vogel (Hg.), Wirtschaftsgeschichte als Kulturgeschichte: Dimensionen eines Perspektivenwechsel, Frankfurt/New York, p. 435-454.

[25] Louis Armand, Einleitung, in: U.I.C. 1963, Symposium über die Anwendung der Kybernetik bei den Eisenbahnen, Paris 4.-13.11.1963.

[26] See: David Gugerli, Internationalität der Eisenbahn: Zur analytischen Bedeutung einer handlungsleitenden Fiktion, in: Monika Burri et al. (Hg.) 2003, Die Internationalität der Eisenbahn 1850-1970, p. 13-20.

loops exist in every organism and therefore also in our company."[27] But these newly revealed closed loops inside the company were insufficiently "closed". Wichser blamed this deficiency to the decentralized structure of the company and to the lack of data. The latter should be compensated with the help of the new information technology-division, which had the task to "provide data for controlling cybernetic systems". The next step consisted in the mechanization of the operating instruments and the third step in the mechanization of the control operation itself – Wichser designated this last stage as an "automatic cybernetic system".[28] Nowadays, 40 years later, we are approaching this vision: by 2015, SBB intends to finish the automation program of all its railway control centers and to centralize them[29] – although the recent and major software-breakdown in the Zurich central control station raised some doubts about the viability of an entire automation of all safety and control operations.[30]

[27] Otto Wichser, Mit modernen Mitteln in die Zukunft, in: SBB-Nachrichtenblatt, 9/1965, p. 3.

[28] Ibid.

[29] Ruedi Eichenberger, "Vers l'automatisation", in: Courrier CFF, No. 4, 16.2.2005, p.6-7.

[30] On February 7th, one erroneous manipulation in the Zurich central control system led to a breakdown of all train operations in the greater Zurich area and far beyond for several hours. See: „Herz des SBB-Netzes lahmgelegt: Zugsausfälle und Verspätungen nach Pannen in Zürich", NZZ 8.2.2005; Ruedi Eichenberger, „De quoi réfléchir", in: Courrier CFF, No. 4, 16.2.2005, p. 2.

3. Different ways of speeding up

3.1 From a capacity shortage to a high-speed project

In the same year 1965, SBB faced diminishing numbers of rail passengers. The trend towards a relative decline in passenger traffic-numbers correlated with the booming road and air traffic and also affected the other European railway companies. By 1966, five years after their best business result ever, SBB faced their first deficit, which could then still be coped with capital reserve. In 1968, the head of the directorate-general Otto Wichser warned SBB employees "not to expect any miracles", as the company's expenses had increased by 79% from 1956-1966, whereas the company's income had only increased by 64%. In the consequence, SBB's financial success diminished by 100 million CHF from 1962 to 1967.[31] And by 1971, the internal reserves were consumed: The deficit now amounted to 54 million CHF.[32]

The company suffered a structural crisis in the second half of the 1960s before it was even hit by the recessive consequences of the oil price shock. In this context, the so-called commercial service for passenger traffic presented in 1967 a report for the "amelioration of competitiveness in passenger traffic", which contained data and prognosis about the national as well as international development of the modal split. The "commercialists" as they were called, enlisted a whole set of measures, amongst them a "significant" reduction of the travel time, more frequent connections, the introduction of a cyclic timetable ("rhythmischer oder starrer Fahrplan") for the intercity and commuter train services, the modernization of railway stations, train connections to the Swiss airports and an intensified collaboration with the other public transport enterprises.[33] The discussion about these suggestions took place in 1968 and proved to be far-reaching. Max Portmann who was engineer in chief and head of the construction division, stated in his synopsis that it was mainly the time for changing to the connecting trains, which influenced the overall travel speed. Only in the intercity passenger traffic, Portmann estimated, enhancing the running speed made sense. In all other cases, much more could be won by timetable optimization and by adapting the traction vehicles.[34] This

[31] Otto Wichers, Nochmals: Wunder sind keine zu erwarten, in: SBB-Nachrichtenblatt, 2/1968, p. 5.

[32] SBB-Archiv, SBB40_009-01, Anpassung der Bahntarife an die wachsenden Kosten, Schreiben ans EVED vom 8.9.1972; Geschäftsbericht SBB 1976, p. 16.

[33] SBB Archive, SBB39_009_25, KDP, Beilage 3: Verbesserung der Leistungen im Reiseverkehr (11/1967).

[34] SBB Archive, SBB39_009_25, M. Portmann, Erhöhung der Reisegeschwindigkeit und Feste Anlagen (Exposé an der Konferenz vom 29.3.1968).

statement is quite remarkable, for it shows the construction engineer's sceptical attitude towards the high-speed discourse. But the majority of SBB agents agreed on the calculations, which showed that the desired travel-time reduction could not be met with conventional means. Instead, "far-reaching measures" like the development of vehicles with pendulum suspension and the "specification of a high-speed railway net" had to be undertaken. The latter proposition was explained with arguments of inherent necessity: Due to the expected traffic increase, there was a necessity for SBB to expand and renew some of its lines. SBB should therefore take the chance and construct new and straighter lines and trace them out for speeds up to 250km/h. Though Swiss topographic conditions were not favourable for doing so, SBB should consider constructing high-speed lines also because this was surely to become an international issue and Switzerland would hardly be able to keep out.[35]

Five years later, in 1973, the vice director of the Federal Traffic and Transportation Office took notes of a meeting with SBB executives about their high-speed project, named "New Main Rail Traverses" (NHT). According to these notes, SBB engineer Oskar Baumann who has been labelled "father of the high-speed train", expressed himself ambiguously. He obviously said "they" – he probably meant his office inside the construction division – had always put the accent on efficiency and capacity. But "SBB" or the "news service of the directorate-general" – which could mean the commercial service division or the secretariat general, both of them non-engineering divisions – always had pushed towards high-speed. [36] Should we understand the high-speed project "NHT" as a result of a mainly commercial discourse, which questioned the engineering approach of incremental technical progress? There are some clues to this reading: In the face of the traffic increase and capacity shortage in freight traffic, SBB tried to raise their output by extending their capacities. This contained upgrading single-tracked lines and disentangling the slow and the fast, the passenger and the freight rail traffic with the help of line extensions and tunnels. Maximum driving speed could be raised incrementally from 90 to 125 or more km/h. The so-called Heitersberg-line between Killwangen and Lenzburg on the Zurich-Bern axis was the first new bit to be traced out for 140km/h. While the Heitersberg-line did not meet public resistance, line extension-projects on the Olten-Bern part raised heated debate and opposition since 1966. Peasants, forest owners and environmentalists fought against it and could even win the support of some Swiss

[35] SBB Archive, SBB39_009_25, Protokoll der Besprechungen vom 29.3. und 5.6.1968 zur "Verbesserung der Wettbewersbsfähigkeit im Reiseverkehr". In June 1968, an international symposium on railway high-speed took place in Vienna.

[36] Für diese und andere Aussagen aus den erwähnten handschriftlichen Notizen siehe: Eidg. Amt für Verkehr, Fernverkehr/NHT-Gesamtkonzept, 1969-1975, Notizen einer Sitzung SBB-EAV vom 15.3.19723, in: BAR E8100C#2000/113, Band 1.

cantons. SBB planners called this an injustice and pointed towards the invasive effects the motorways had on the landscape.[37] In the already mentioned meeting with the Federal Office, Baumann, who had been part of the planning team in 1966 remembered that SBB had been sceptical towards high-speed trains: "We don't have Japanese circumstances here", they used to say, he recalled.[38] And indeed, Otto Wichser, head of the directors general and former head of the construction division had shown himself reluctant in 1969: A member of the SBB administrative board thought the incremental speed increases were not sufficient and suggested to study the high-speed train projects in the surrounding countries. Otto Wichser avowed that a new straight line between Zurich and Berne could reduce the travel time to only 45 minutes. But the mid-term traffic increase was not enough to render such an input profitable, he affirmed. Instead, SBB would put the accent on the construction of the new lines between Berne and Olten, the Heitersberg-line and the development of the pendulum suspension.[39]

We can conclude that Shinkansen produced no euphoria for speed in the SBB headquarters. SBB high-speed plans reflected the painful experience the motorway competition had on the railways' share in the modal split and on SBB's financial results: Given the necessity to renew or expand some of the tracks anyway, the Japanese role model, which relied on conventional rail technology, was to a certain degree connectable to SBB exigencies. Other than in Japan, where Shinkansen competed with homeland air traffic, SBB attached themselves closely to the airlines and the airports in order to profit from the increasing air traffic. SBB held Swissair stocks and met Swissair executives "regularly" in order to be on "good terms" with them. The aim of this was to provide a direct train connection to and from the Zurich and Geneva airport. And it worked: Oskar Baumann and his engineers at the "study-office" succeeded 1970 when they suggested a new intercity line from Zurich main station to Zurich airport which could be integrated into a future high-speed rail net.[40] The same argument was brought forth in the case of Geneva-Cornavin airport. The plans for a trans-European high-speed rail

[37] SBB Archives, E8300B#1999/195, Bd. 5: VR-Protokoll, 27.5.1970, Trakt 4: Eisenbahnplanung im Raum Olten-Rothrist: Referat von Herrn Oberingenieur Portmann.

[38] Swiss Federal Archives, E8100C#2000/113, Bd. 1, BAV, Fernverkehr/NHT Gesamtkonzept, 1969-1975: Sitzungsnotizen vom 15.3.1973.

[39] SBB Archives, E8300B#1999/195, Bd. 5: VR-Protokoll, 28.4.1969.

[40] SBB Archives, E8300B#1999/195, Bd. 5: VR-Protokoll, 28.4.1969: Beteiligung der SBB an der Kapitalerhöhung der Swissair; der Bau von Anschlussgeleisen zu den Flughäfen; VR-Protokoll, 11.9.1970: Flughafenlinie Kloten. Antrag um Bewilligung eines Teilkredits für Vorinvestitionen; Oskar Baumann, Die Schienenverbindungen Berns zu den Flughäfen im Rahmen der Schnellverkehrsplanung der SBB, Vortrag vor der Vereinigung gegen den Ausbau des Flughafens Bern-Belp, 24.11.1970 in Muri b.Bern.

net and the discussion about a new railway alpine tunnel, intensified in the early 1960s, were the arguments for designing a North-to-South high-speed traverse apart from the described East-to-West high-speed line.[41]

Let's turn back to the meeting between SBB and the Federal Traffic and Transportation Office in 1973: Baumann, who had just mentioned the former scepticism reigning at SBB, then stated that speed really was important – because of the motorways. The population had to be showed that the railways were capable to develop, he said. "Otherwise, people will say: this doesn't make sense anymore."[42] Was a high-speed train the only chance to legitimate the existence of the railways in a society, which was structured more and more according to auto-mobility?

3.2 The "Railway of the Future" of 1969

In September 1969, the SBB directorate-general presented its future planning to the board. The document with the title "Funding the Expansion of the Swiss Federal Railways in the Coming Years" resumed the planning progress since the mid-60s and offered an integral vision of a Swiss type of the "Railway of the Future".[43] Some of the suggested measures and the division in subsequent planning phases resemble the five year-plan of the Dutch railways (Nederlandse Spoorwegen) published the same year.[44] SBB designed a "modernization and restructuring of the railways", which should enable an effective and efficient processing in traffic areas which naturally suited the railway system.[45] Not suitable were for example the passenger transport on very long distances taken over by the airlines and the distribution of weak traffic flows in dispersed areas for which private and public road traffic was in charge. The planning model contained a short-, mid- and long-term planning phase. In the first phase, the regular renewal of infrastructure and rolling stock as well as the continued process of

[41]:Jakob Rutschmann, Gotthard-Basislinie: Von ersten Studien zum Bauprojekt 1975 - Opfer der Politik und des Kleinmutes. Vorabdruck SBB-Historic, Bern 2004.

[42] Swiss Federal Archives, E8100C#2000/113, Bd. 1, BAV, Fernverkehr/NHT Gesamtkonzept, 1969-1975: Sitzungsnotizen vom 15.3.1973.

[43] SBB Archives, E8300B#1999/195, Bd. 37: Die Finanzierung des Ausbaus der Schweiz. Bundesbahnen in den kommenden Jahren, Entwurf vom 5.9.1969.

[44] Der Fünfjahresplan der Niederländischen Eisenbahnen, in: Internationale Eisenbahnnachrichten, 4/1969, p. 5-11.

[45] The German term is: "wesensgerecht" as in: "wesensgerechter Verkehr", frequently used in the 1960s and 1970s.

rationalization were mentioned. The second phase introduced "the first steps towards the railway of the future" which at the same time was a "railway without borders." This planning unit contained an ameliorated train service with more frequent and more suitable train connections, enhanced comfort, high-speed systems for high density areas, a "rhythmic timetable" between the main cities, attempts with pendulum suspension vehicles for speeding up in the curves, a base tunnel through the Alps, the introduction of the European automatic coupling and the development of an interoperable train control and security system on the base of an inductive loop.

The third planning phase contained the automation of the shunting process and the vehicle guidance on the main lines, the installation of a real-time information system and the computerized control of all operating schedules – the "realization of an automated railway in the form of a cybernetic man-machine-system." In the field of high-speed, the third planning phase should include the construction of a "cross of lines from West-to-East and from North-to-South for a running speed above 200km/h with extensive new tracks." Even "completely new transport technologies as for example the air cushion rail" were mentioned to be possible options for the future.[46]

On St. Nicolas Day of 1969, SBB made their plans public for the first time. Oskar Baumann, then head of the "study-office construction and operation" of the directorate-general, exposed them in a speech with the title "The Swiss Federal Railways look towards the year 2000" in the hall of the Swiss traffic and transportation museum in Lucerne. Baumann described in detail the automation plans and their effects on the future rail traffic. He mentioned the projects for a cyclic timetable, which he described as "absolutely necessary" between the cities for the railway to become an alternative to the car. When speaking about high-speed, Baumann distanced himself from non-conventional technologies and instead described the means for incrementally increasing the velocity until 160km/h: straightening of curves, extension of tracks and pendulums suspension vehicles. Only then, on the last two pages of his 20-pages-speech did he mention "how things could be continued": namely towards a high-speed line from Zurich to Berne and from Basel to Chiasso where maximum velocities of 250 or 300km/h were possible, allowing to reach Zurich from Berne in only 30 minutes. This served as a proof that SBB were also "boldly looking for new ways of how to attain far-reaching goals". This was necessary, Baumann concluded, as "the future begins earlier than we think it does."[47] On the whole, Baumann disguised the competition argument so central for

[46] SBB Archives, E8300B#1999/195, Bd. 37: Die Finanzierung des Ausbaus der Schweiz. Bundesbahnen in den kommenden Jahren, Entwurf vom 5.9.1969.

[47] Oskar Baumann, Die SBB auf dem Weg ins Jahr 2000, Vortrag gehalten an der 22. Mitgliederversammlung des Verkehrshauses der Schweiz, Luzern, 6.12.1969, especially p. 20-23.

SBB. Instead, he externalized the need for expansions: they were necessary to meet the exigencies of spatial planning, of the public good and of the national economy.

3.3 A flexible system-innovation called "Taktfahrplan"[48]

The already mentioned "study-office", where young construction engineer Samuel Stähli entered to work on the high-speed lines in 1968, had emerged from the single office of Oskar Baumann, which this one had been conceded in the early 1950s.[49] Until 1975, when a proper corporate-staff was installed, the "study-office" exerted a sort of staff- and think-tank-functions for which reason contemporary SBB agents call it "legendary". Is it a mere casualty that Baumann who probably knew about the Dutch five-year plan when he worked on the SBB future planning in 1969 and whose wife was Dutch, supported Stähli in his efforts to develop a timetable system inspired in the Dutch model? Stähli already published an article referring to this subject in his second year at SBB, in 1969.[50] Back in 1955, SBB had worked on a concept for a Zurich area commuter train based on a fixed 30-minutes-interval. It was put into practice in 1968 on the Zurich-Meilen-Rapperswil line.[51] By then, some private Swiss railways also used cyclic timetables on a couple of regional lines. Even earlier, in 1953, an SBB timetable commission visited the German Federal and the Dutch Railways in order to study their timetable scheduling. In their report, the Western Germany cyclic timetable examples were analyzed as better comparable to Swiss circumstances.[52] Nevertheless, the model of the "Nederlandse Spoorwegen" (NS) was much more important in the pre-history of the Swiss integrated fixed interval timetable. Because other than the German railways, the NS had introduced their cyclic timetable on the whole net already in 1938, when they were given the legal form of a private stock corporation with the state owning a 100 per cent of the stocks.[53] This setting, which then seemed quite "exotic" compared to other European

[48] "Takt" = in time, rhythmically, musical beats.

[49] Interview with Ernst Müller, 18.1.2005.

[50] Samuel Stähli, Grundfragen der Fahrplangestaltung, in: Monatsschrift der IEKV, 7/8 1969, S. 445.

[51] SBB Archives, E8300B#1999/195, Bd. 5: VR-Protokoll, 19.2.1969: Ausbau der Linie Zürich-Meilen-Rapperswil: Erhöhung des Baukredits.

[52] SBB Archives E8300B#1999/331, Bd. 124: Fahrplankommission SBB, Bericht über Fahrplan und Betrieb der Deutschen Bundesbahn, (Studienreise vom 6.9.-1.10.1953): Zusammenfassung und Anträge, p. 32.

[53] P. Boender, Die niederländischen Eisenbahnen als kommerzielles Unternehmen, (Vortrag vom 1.10.1954 vor den Mitgliedern der verkehrswissenschaftlichen Gesellschaft an der Universität Münster, Hohensyburg bei Dortmund), Göttingen: Vandenhoeck & Ruprecht o.J.

railways, resembles very much the institutional setting of today's SBB. In the report about their trip to Holland, the SBB commission quoted the head of the Dutch timetable division, who held that the introduction of a cyclic timetable on the Swiss main railway lines with its timetable being connected with a lot of international and transitional trains was an "impossible thing".[54] The very circumstances of the "Randstad Holland" – equal distances from town to town, a peripheral geographical position and in consequence more autonomy in terms of timetable planning – seemed to put an obstacle to copying the Dutch timetable for the whole Swiss railway net. Nevertheless, SBB in their "inventory of rationalization measures" resulting from the study of the Dutch timetable model, envisioned a possible "step-by-step introduction of a cyclic timetable for the internal traffic on the whole net" with the exception of the international transit line Basel-Gotthard-Chiasso.[55]

The so-called "madcups' club" or "spinning club" (Spinnerclub) was an organization well accepted and appreciated by the directorate-general. Young business economist Jean-Pierre Berthouzoz founded the club in 1971 after attending an SBB marketing seminar, where he learnt that so-called "Spinnerclubs" were a way for company novices to interchange innovative ideas useful to the company in private business.[56] In this "Spinnerclub", Samuel Stähli found companions – Berthouzoz and the mathematician Hans Meiner -, with whom he could work on the timetable studies. For his first draft had not been received positively. Never mind the negative opinion of the Dutch railway expert in 1953, in 1972 Stähli obviously enjoyed support from Dutch railway executives with whom he cultivated a friendship.[57] The wife of Oskar Baumann translated the „Spoor naar 75" from Dutch to German, which included a timetable schedule net-chart without which the conception of the "Taktfahrplan" would not have been possible. In 1971 and 1972, the three authors regularly came together on late Monday afternoons to work on the concept. The meetings were often prolonged until the night and celebrated in the Bernese Restaurant "Bierhübeli" with sausage and "Rösti". The idea for the melodic name "Taktfahrplan" – meaning "in time" as well as "rhythmically" or following a musical beat – came to Verena Stähli, wife of Samuel Stähli, who thought that

[54] SBB Archives E8300B#1999/331, Bd. 124: Bericht über Fahrplan und Betrieb der Nederlandse Spoorwegen, (Studienreise vom 15.3.-2.4.1953), p. 39.

[55] Ibid.: "Verzeichnis der Rationalisierungsmassnahmen".

[56] Interview with J.P. Berthouzoz, 21.1.2005.

[57] Especially with Dr. Theo Tielemann who by the end of the 1980s was head of the finance-and-controlling division inside Nederlandse Spoorwegen.

"starrer Fahrplan" meaning "rigid or fixed timetable" sounded not very attractive for potential railway passengers.[58]

The myth surrounding the "Spinnerclub" - apart from the sausage and "Rösti" touch – has to do with the fact that it seems hard to believe how a highly formalized and hierarchical organization could possibly cope with such non-conformist actions. But already Niklas Luhmann reflected about how formal organizations tolerated acts of informal infringements he called "useful illegality" because they generated creative and innovative results.[59] This analytical frame suits the institutional setting of the "Spinnerclub" and its members who used to ascribe themselves a "subversive" function, which obviously was also felt this way by some superiors in an intermediate position.[60] In their "New Passenger Rail Concept", the authors tried to connect their innovation to the projects for expanding or newly building of railway lines. They argued that with the help of a integrated fixed interval timetable, future track capacities would be better utilized. As long as only minor changes had been made on the track infrastructure, "organic" timetable adjustments had been enough. The construction of the new Heitersberg-line and the connection to the Zurich airport, though, led to an "entirely new situation": "The form of and the travel times on the intercity-net will change in such a degree that it cannot be dealt with them through only small adjustments."[61] This institutional "subversion" was presented on the occasion of a conference of the association of SBB engineers in June 1972, which proved to be a clever way to avoid that the concept disappeared in some superior's drawer.

The strategy worked: SBB president Otto Wichser congratulated the authors and a full-time project committee was appointed to study the viability of the concept and to plan its eventual realization. The formal organization and the hierarchical order took over again: the committee's president was the head of the operation division responsible for timetable issues. An idea developed under specific circumstances of a "useful illegality" and by an informal "sub-system" was thus re-integrated into the formal "super-system." For the idea to be realized, its high flexibility and adjustability proved to be useful. Personally, Stähli was not convinced, that the "New Main Rail Traverses" high-speed lines were feasible. But he and his co-authors allowed for the timetable innovation to be introduced in different stages, "be it in a

[58] Interview with Verena Stähli, 6.9.2004.

[59] Niklas Luhmann (1999), Funktionen und Folgen formaler Organisation (original version: 1964).

[60] I gained these informations from several interviews with contemporary witnesses like Jean-Pierre Berthouzoz, Reto Danuser, Ernst Müller, Verena Stähli, Peter Winter, Peter Zuber.

[61] Berthouzoz, Jean-Pierre; Hans Meiner, Samuel Stähli, Taktfahrplan Schweiz: Ein neues Reisezugkonzept, herausgegeben anlässlich der Fachtagung der Gesellschaft der Ingenieure der SBB in Choindez 16.6.1972.

far future after setting up high-speed lines in the midland or new Alpine traverses or be it in the very near future, namely in 1975, when the Heitersberg-line will be opened."[62]

The cyclic timetable has an inherent rationalization potential, like SBB noted already in 1953. Because of this potential, it also proved to be connectable to the changing circumstances the recession of the 1970s created. Its concept matched perfectly with the "rationalized railway system" as designed in the "Report 1977" where SBB presented a relentless analysis of the company's actual state and different scenarios ranging from a radical to a moderate cutback of services.[63] The moderate rationalization scenario with the "Taktfahrplan" also entered the first service mandate between the Federal Government, the Parliament and SBB in 1979/80. It held that, "surveys show that in most of the cases a further rationalized railway system (i.e. in particular *"Taktfahrplan"*, no-conductor trains, restriction or suspension of personal service at railway stations) would provide the best economization, on the whole about 25 Mio. CHF a year."[64]

[62] Ibid.

[63] SBB library, Unternehmerische Massnahmen und verkehrspolitische Vorschläge zur Sanierung der SBB, 15.10.1976 ("Report 1976"); Bericht 1977: Mögliche Angebotskonzeptionen der SBB und flankierende Massnahmen, 14.10.1977.

[64] Botschaft über den Leistungsauftrag 1980 an die Schweiz. Bundesbahnen, vom 24.10.1979, in: BBI, I, 1980, p. 316.

4. The transition to Rail 2000

4.1 Of continuity and change

The historian who investigates into the reasons for the abandonment of the high-speed NHT-project and into the origins of Rail 2000 will soon wonder what is more important: continuity or change? Because the search for either continuity or interruption/change as two main characteristics structuring past events and developments, is a main duty for the historical science which not only tries to emulate, but also to explain changes over time. In the case of Rail 2000, this question leads to a complex sample of answers. Historians have to distinguish between features, which can be "objectified" in one way or another, and a sort of a "sense-making historic discourse" produced by the involved agents. The initially quoted statement by today's SBB CEO Weibel, where he described the transition from "NHT" to "Rail 2000" as mainly a public-relations measure, belongs to this second category.[65] Not the interpretation as such is remarkable, but the fact that Weibel is admitting a tight connection between NHT and Rail 2000. Considering the stormy history of NHT and also of Rail 2000 in the first half of the 1990s, this is not self-evident. But it is proof of the sort of dispassionateness, which is the result of a sound distance from the difficulties Rail 2000 caused. The comparison between the early high-speed line project and today's Rail 2000 produces much more differences than the comparison between the NHT-project, which was submitted to the public consultation in 1983 with the early sketches of Rail 2000 in 1984/1985. SBB agents tended to distance themselves from the "full-of-concrete-project" NHT and emphasized the software-orientation of "Rail 2000" (i.e. timetable innovation and "electronics instead of concrete"), but in its early stage, Rail 2000 was rather heavy on concrete. The concept, which was voted for in December 1987 still contained four major new lines in different Swiss regions.

It was not mainly the amount of concrete which made the difference for SBB planners, but the fact, that the NHT-project had neglected the necessity to present itself as an overall service expansion – the modern "Railway of the Future", like it had been sketched in 1969. The directorate-general affirmed in 1984 that the NHT also "contained (…) a new supply concept" apart from the new to build and expanded lines between the Lake of Geneva and the Lake of Constance. But political discussions showed that the public was mostly unfamiliar with this

[65] Benedikt Weibel, Von der Schnellbahn zur S-Bahn Schweiz, Rede an der Einweihungsfeier der Bahn-2000-Neubaustrecke Mattstetten-Rothrist, 21.10.2004.

concept. Therefore, the directorate-general suggested to "extend the NHT-concept into a supply concept called "Rail 2000 (working title) with the NHT as a backbone."[66]

The decision to proceed to a stage-to-stage realization of Rail 2000 in the early 1990s contained abandoning three of the four projected new line parts. Remained the new line part between Mattstetten and Rothrist on the Berne-Olten line, which in the following was labelled the "heart" of Rail 2000. In the recessive crisis of those years, financial reasons influenced this decision heavily, as the Federal Councillor put a stop to the project activities of SBB, which by then had entered the deficit zone again, when the originally previewed budget for Rail 2000 had almost tripled.[67] But at the same time, this decision enabled SBB to win back more agency and autonomy in a political and economic surrounding characterized by a growing complexity: the struggling about the new line projects and their environmental sustainability could be restricted to the one piece in the midlands between Olten and Berne. Whereas the decision about and the conception of new rolling stock like the double-decker trains or the trains with pendulum suspension, the new train control system and shorter train delays did not affect the public good and could be managed by and within the company. The different project managers of Rail 2000 were not only confronted with a financial crisis and a crisis of confidence, but also with the necessity to re-internationalize the national perspective of the rhythmic timetable and the early Rail 2000-concept in order to guarantee the harmonization with the EU traffic policy. This internationalization should be attained by adjusting the new line and parts of the New Alpine Rail Traverses (NEAT) to the EU high-speed standard and by the NEAT projects, which restrained the budget for Rail 2000, in general.[68]

4.2 Four theses on the relationship between NHT and Rail 2000

Unlike the competition-by-automation paradigm, the competition-by-high-speed paradigm was never unanimously met inside SBB.

[66] SBB library, „Neue Haupttransversalen (NHT): 2. Bericht über den Stand der Arbeiten" vom 5.6.1984, in: VR-Vorlagen 1976-1979.

[67] See: Christina Leutwyiler, "Bahn 2000: Fehler auf allen Stufen", in: Tages-Anzeiger 10.10.1995. The development of the SBB-deficit: 1992: -28 Mio. CHF, 1993: -38 Mio. CHF, 1994: - 198 Mio. CHF. Source: SBB Annual Reports 1992-1994.

[68] See: Die erste Etappe der Bahn 2000: Bericht der Generaldirektion SBB an die Oberbehörden vom Juni 1993, in: Schweizerische Eisenbahnrevue, 7-8/1993, p. 320-323.

It has been shown with how little euphoria SBB welcomed the international high-speed vision. The Rail 2000-slogan: "not as fast as possible, but as *quick* [in German: "rasch"] as necessary" was a handy formulation of the aversion SBB agents felt against a purely technicist speed discourse. Already in 1975, Oskar Baumann warned in a document referring to the current high-speed train projects in Switzerland and Europe that the "technological possibility of a track-bound high-speed rail traffic in itself (…) is not a sufficient argument to make its realization seem expedient or even inevitable."[69] The use of the German adjective "rascher", which was often combined with the terms "häufiger" (more frequent), "direkter" (more direct) and "bequemer" (more comfortable) in the Rail 2000-publicity, expresses a preference for a moderate velocity, not so much resulting of a linear speed explosion, but of smooth and therefore "quick" transitions and connections. The rail trip with Rail 2000 made transitions from one sub-system to the next decisive: If they could be devised as "smooth" as possible, the result would be a reduction of the overall travel time. The other side of the coin were the potential negative and cumulating feedbacks in this profoundly interdependent, actually cybernetic system compounded of the cyclic timetable and the symmetry of the nodal system.[70]

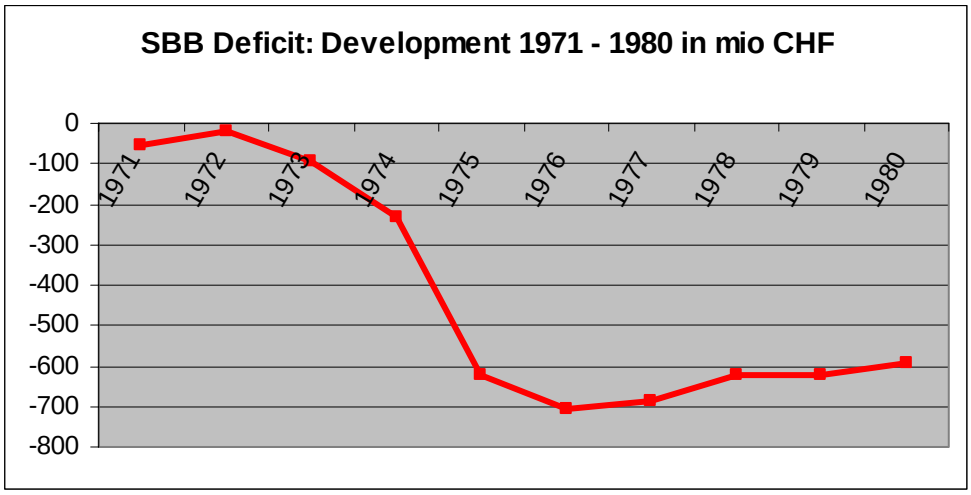
The recession of the 1970s reinforced the structural crisis of SBB in an unexpected degree. The fact of the high deficits restrained the scope of decision-making and action of SBB executives and favoured a moderated project with a mainly national focus.

Parting from the situation of a structural budgetary crisis since the mid 1960s, the SBB account became entirely off balance in the 1970s due to the heavy short-term fluctuations in the traffic market: From 1974-1976 SBB had to cope with major irruptions in their passenger and freight traffic. A wrongly termed price increase, which became valid in 1974, only deepened the irruption of the passenger traffic:

[69] See for example: Gespräch mit SBB-Generaldirektor Hans Eisenring zum Projekt BAHN 2000, in: Schweizerische Eisenbahn-Revue, 2/1985, p. 44.

[70] „Herz des SBB-Netzes lahmgelegt: Zugsausfälle und Verspätungen nach Pannen in Zürich", NZZ 8.2.2005.

Figure 3 Development of SBB deficits between 1971 and 1980



Source: SBB Annual Reports 1971-1980

The vision of a "Railway of the Future" implying billions of Swiss francs became clouded in times where SBB's deficit arose to more than 700 million francs. "Recently, public opinion became more critical towards technical progress", Oskar Baumann stated in 1975. He then undertook the interesting and ambivalent attempt to connect SBB's planning to the overall European context of the European Infrastructure Guidelines regarding rail high-speed traffic.[71] I call this attempt ambivalent because SBB had been following two different lines of discourse and action throughout its history. Sometimes these two lines would go in the same direction, but sometimes they tended to collide. One tradition originated from the winning slogan of the popular vote about the nationalization of the privately held railways in 1898: "The Swiss railways belong to the Swiss people." The slogan pointed to the fact that a lot of foreign capital had been invested in the building and business of the major Swiss railways. This patriotic-autonomous story line appealed to the homeland public. The other line of discourse was about internationality and interoperability: its roots go back to the building and financing of the Gotthard alpine tunnel in which Italy, Prussia and other German state - later the German Empire – participated substantially.[72] Swiss railway executives have always been active members or co-founders of international rail traffic organizations. With its transit

[71] Baumann, Oskar, Die Planung des Eisenbahn-Schnellverkehrs in Europa und der Schweiz, hg. von der Gesellschaft der Ingenieure der SBB, Bern, Juni 1975.

[72] In German the slogan said: "Die Schweizer Bahnen dem Schweizer Volk". For the rest see: Konrad Kuoni, Der Gotthard gewinnt das Alpenbahnringen, in: Elsasser, Kilian T. (Hg.), Kohle, Strom und Schienen: Die Eisenbahn erobert die Schweiz, Zürich, 1998, p. 144-164.

position in Europe and it's strong interest in traffic income from trans-national trade and from tourism, Switzerland traditionally had to concede special attention to questions of technical interoperability and the connective possibilities of the timetable. Because of the geographical position of Switzerland had the timetable commission of 1953 denied the possibility to imitate the Dutch cyclic timetable. The internationalistic railway discourse therefore seems to have been reinforced between the late 1950s and the early1970s compared to the years before and immediately after. The NHT-project must be seen as an output of this tradition.

With the integrated fixed interval timetable and Rail 2000, the perspective of Swiss passengers and of national politics was prioritized. Or in the words of the Rail-2000-project manager: "The step from the NHT to the concept Rail 2000 is a mental leap from an investment oriented idea with international character to an overall service offer with a mainly national character with the possibility to include international concerns anytime."[73]

Rail 2000 is the combined result of a renewal and of continuousness on the level of human resources.

The head of the SBB administrative board, the liberal politician and lawyer from the Canton of Vaud Carlos Grosjean, played a major role in changing the direction of the shipwrecked NHT-project: After analyzing the depressing results of the public consultation of NHT, Grosjean in the end of 1983 had a talk with the responsible Federal Councillor Leo Schlumpf and in the early months of 1984 exposed his concerns to the SBB directorate-general in what Hans Eisenring, then director general for the technical department, remembers as a true "slating".[74] Eisenring then equipped himself with a planning staff ("Zukunftsstab") and appointed Samuel Stähli as its head. The "Taktfahrplan"-inventor had been working successfully on the new Zurich rapid transit railway system ("S-Bahn Zürich"). The decision to appoint Stähli decisively guided the pathway of Rail 2000: Stähli integrated the systemic foundation of the integrated fixed interval timetable, of the nodal system and of the Zurich rapid transit train into the amendment of the NHT. Whereas Grosjean and Stähli represented a (innovative) continuity at SBB, Eisenring and Michel Crippa personified the renewal: Eisenring, engineer and former head of a private airplane, military goods and rolling stock company producing also for SBB, had been appointed to the management of SBB to bring some "fresh wind" of private business experience into the directorate-general in 1983. And Crippa was called to the SBB in 1980 after having made a career in the petrol business. He

[73] Peter Winter, Die Planung für Bahn 2000 im Bereich der ortsfesten Anlagen, S. 160, in: Schweizerische Eisenbahn-Revue, 5/1987, p. 152-163.

[74] SBB library, „Neue Haupttransversalen (NHT): 2. Bericht über den Stand der Arbeiten" vom 5.6.1984, in: VR-Vorlagen 1976-1979; Interview with Hans Eisenring, 26.1.2005.

was supposed to direct the newly installed marketing staff.[75] The creation of the marketing staff resulted from an evaluation of SBB's business processes made by auditing experts in the late 1970s.[76] After that, Nicolas Hayek in his study of SBB top-level structures suggested to make marketing a top-level issue.[77] Crippa then became director general of the former traffic department, which was now called "marketing and production".

Rail 2000, unlike the NHT, is characterized from the onset by an explicit customer and marketing orientation as well as by a modern communication strategy.

Due to the continued popular opposition against the plans for a new railway line between Berne and Olten, the Federal Traffic and Transportation Office and the SBB directorate-general agreed in 1974 on a three-stage-plan. The NHT should be offered to the public slice by slice. The Federal Office suggested SBB directors to prioritize the new to build lines on the Olten-Berne and Basel-Bern axis as "necessary expansions of capacity for the Alpine transit traffic" and for the "official onset of a high-speed cross." But: "It will not be possible to legitimate the intended new line from Rothrist to Berne with scarce capacities only. There will also be a need to mention the importance of the line as a first element of the future high-speed cross which makes it necessary to sketch this high-speed cross and its main features." This reasoning lacks any consideration of potential customers' wishes and any vision of a marketing or communication strategy to boost public acceptance of NHT. The justification of the project was more important than the question where exactly to build the new lines, the Federal office continued in its letter. This justification had to contain the needs of SBB, international developments in the traffic sector, the exigencies of and consequences for the spatial planning policy as well as the aspects of traffic, economic and financial policy of the project.[78] Such an argumentation did not appeal to the potential voters in their role as railway passengers in the first turn. Instead it appealed to their membership in the national common destiny which had been developed in the 1930s to overcome the economic and social crisis and which had reached its climax in the "Spiritual Defence" of the pre-war and war years. But the common-destiny-members did not fall for technicist concepts developed according to international guidelines and discourse. A reporter of the Solothurn Newspaper pictured the

[75] SBB Archives, SBB40_010-05, Marketing bei den SBB, GD-Vorlage vom 21. November 1979.

[76] Ibid.

[77] SBB Archives, SBB40_003_23, Aktionsprogramm Projekt 1: Führungs- und Entscheidungsprozesse, Vorstudie Neuregelung von Führungs- und Entscheidungsprozessen SBB, Hayek-Engineering AG Zürich, Februar 1983, p. 5.

[78] Swiss Federal Archives, E8100C#2000/113, Bd. 1, BAV, Fernverkehr/NHT Gesamtkonzept, 1969-1975: "Erarbeitung eines Schnellbahnkonzeptes" (Letter of the Federal Office to the SBB, 25.2.1974).

mood of the local population along the projected new line in 1975: „The high-speed train will lead us straightforward to Brussels and the EEC", these and similar votes could be heard in the crammed country pubs between Langenthal and Utzenstorf."[79]

On the contrary, the members of the "Spinnerclub" had advocated a supply and customer oriented policy in their ideas for rendering the train services more attractive even before modern marketing methods became an action guideline in the SBB management.[80] In the early 1980s, the new marketing staff launched a major publicity campaign. All Swiss households were sent a leaflet with the title: "My railway a la carte".[81] This advertisement tied in with the experiences of Swiss pupils in the 1940s and 1950s, when they were told that all Swiss citizens possessed a couple of railway sleepers.[82] Whereas the communication strategy for Rail 2000 coined it like this in a coloured leaflet from 1985: "Rail 2000 – more rail for everybody." The leaflet contains a photograph with ten smiling individuals different of age, sex and social habit, obviously representing the Swiss population.[83] In an early sketch of the Rail-2000-concept with the provisional title "Rail 90", one of the targets of the concept was depicted as to "design an image of the railway of the 1990s, which can subjectively convince the majority of the voters (…)."[84] By the mid 1980s, when the relative share of private road traffic reached its peak in the modal split statistics, only a small minority of the adult Swiss citizens were regular railway passengers.[85] This meant that also the car driving voters had to be won over. For this reason, one of the posters for the popular vote in December 1987 about Rail 2000 pictured a smiling car driver and the slogan: "Yes to our Rail 2000… because traffic jams are of no use for anybody." Another poster with a soldier pointed to the function the railways played in the military defence schedule.[86] And on another poster you find two

[79] Bruno Franig, SBB-Schnellbahn Bern-Zürich wieder im Gespräch: Mit rasendem Tempo in die Versenkung?, in: Solothurner Zeitung, 23.5.1975.

[80] Amongst other things, the "Spinnerclub" also conceived an "Image-Report" in November 1975.

[81] Heinz von Arx (Hg.): Der Kluge reist im Zuge: Hundert Jahre SBB, Texte von Iso Camartin u.a., Zürich 2001, p. 168.

[82] Interview with Hans Eisenring, 26.1.2005.

[83] „Bahn 2000 – Mehr Bahn für alle", ed. by EVED, SBB, VSTÖV, 12/1985.

[84] „Rail 90/Bahn 90", SBB working paper of the „Zukunftsstab" in the technical department, without year.

[85] In 1985, the share of passengers using the car in the traffic modal split amounted to 79.3% (1960: 56.8%). The percentage of passengers using the railways amounted to 10.2% (1960: 29.8%). Source: LITRA (2002).

[86] Christian Kräuchi, Ueli Stöckli (2004), Mehr Zug für die Schweiz: Die Bahn-2000-Story, Ottersweiler, p. 15, 68.

trumps of SBB joined together: The baroque Swiss architect Borromini whose face was pictured on the former one-hundred-francs note, advertised for Rail 2000 and for the new half-price railcard. This railcard, which was heavily subsidized by the federal state, cost 100 francs and got introduced in 1987 as one of the environmental measures to combat the dying of the forests by promoting public transport.[87]

Rail 2000 and the Swiss environmental policy entertain a tense and ambivalent relationship. The dying-forest-discourse doubtlessly accelerated the political enforceability of Rail 2000. On the other hand, the policy and the laws of protecting the nature, the landscape and the environment envisioned Rail 2000 as a potentially invasive and harmful enterprise.

During the extraordinary parliamentary debate about the "dying of the forests" in February 1985, proposals for promoting the public transport which originally were raised by the left and green deputies were supported by a lot of liberal and conservative politicians as well – as long as the proposed measures put the accent on market incentives and not on legal interdictions. For the liberal and conservative majority of the Parliament, measures like the densification of the train timetable, quicker connections and higher travel comfort were at least as important as the reduction of transport fares by subsidizing half-price cards.[88] SBB agents profited from the enhanced scope for action the environmental trend conveyed them and affirmed the necessity of tariff measures as well as of infrastructure amendments in order to enhance the attractiveness of the public transport. Hans Eisenring, under whose guidance the concept for Rail 2000 was developed in 1984, holds he never wanted SBB planners to exploit the environmental trend of the mid 1980s for their aims.[89] So it must have been a favourable coincidence that SBB presented Rail 2000 only six weeks after the above mentioned parliamentary debate.[90] Only eight and a half months later, the Federal Council presented the message and credit proposal for Rail 2000 to the Federal Parliament. And by

[87] Ibid., p. 26.

[88] Waldsterben: Bericht und Massnahmen. Debatte im Nationalrat. 6.2.1985, in: Amtliches Bulletin Nationalrat, 1, 1985.

[89] Interview with Hans Eisenring, 26.1.2004.

[90] The official press conference took place on 28.3.1985. But the green-leftist weekly magazine "Die Region" already wrote in July 1984 about the first steps towards Rail 2000 and quoted Samuel Stähli. See: Walter Wyss, „Konzept „Bahn 2000": Aus für Luzerner Variante?", Die Region, 20.7.1984.

December 1986, after the debates of both chambers, Parliament had passed the concept Rail 2000, which then had to undergo public vote because some of the affected communities launched a referendum against it. The reluctance of director general Eisenring becomes understandable when considering the long-lasting opposition against NHT-plans in the Olten-Berne area. The Swiss Traffic and Environmental Club (VCS) even suggested an alternative line-projection in the public consulting of the NHT, which should be less space consuming and which was heavily taken into account by the SBB.[91] Thus, Rail 2000 was in the 1980s not perceived that much environmental-friendly like the heated public and parliamentary discussion ten years later suggested.[92]

[91] SBB library, „Neue Haupttransversalen (NHT): 2. Bericht über den Stand der Arbeiten“ vom 5.6.1984, in: VR-Vorlagen 1976-1979. This may be an explanation for the initially quoted statement according to which Rail 2000 had been conceived by the VCS. Stähli and other “Spinnerclub”-members may also have been members of VCS (Interview with Reto Danuser, 25.10.2004).

[92] Amtliches Bulletin des Nationalrats, 7.10.1985: Bahn 2000. Konzept, p. 1388 (Kühne).

5. Conclusion

How it could have been: The historian proceeds with heuristic and hermeneutic methods: She approaches the object of her investigation by asking questions. And the understanding of one part will always reveal something new about the entire issue whereas as regarding the whole thing will help to understand its single parts. A history of technology and of business is about the relationship between human actors and technical artefacts or procedures on the one side. And on the other side about the relationship between individuals and the organisation which structures their acts. It can easily be interfered from the initial quotations that this is an attempt to historicize the genesis of the integrated fixed interval timetable called "Taktfahrplan" and Rail 2000 as two major innovations of the Swiss Federal Railways in the last 30 years. The focus of investigation must go beyond the company level and into the political, economic and social context of the time. The consideration of the Dutch timetable leads beyond the national territory and points, like the idea of the high-speed railway, which is part of the prehistory of Rail 2000, to international guidelines in the history of technology and of traffic policy.

The name-dropping and the mentioning of childhood hobbies in the initial quotations has more to it than an anecdotic value: It reflects the important roles which human actors play in the process of developing and implementation of innovations. Thomas S. Kuhn and earlier Ludwik Fleck already pointed to the importance of the role of scientists' collectives and their way of thinking (Fleck used the German term "Denkstil") for the succeeding of new scientific paradigms. [93] Needs to be added that scientists or technicians are members of the society and certain social groups with distinctive habits and with a distinctive amount of "social capital" (Pierre Bourdieu). The individual agents – SBB engineers for example – act inside surrounding structures enabling and at the same time restricting their agency. Through their actions – by developing and researching – they are constantly influencing and subtly modifying these structures, which has a feedback-effect on their actions again. This consideration brought forward by the British sociologist Anthony Giddens, which can be traced back to the cultural and economic philosophy of Karl Marx and his reflections upon the dialectics of the man/technology and the culture/nature-relationship, is being reflected and further developed also in system theory and cybernetics. [94] Such theories can therefore offer valuable

[93] Thomas S. Kuhn (1962), The Structure of Scientific Revolutions; Ludwik Fleck (1979), Genesis and Development of a Scientific Fact, (original version: 1935).

[94] Anthony Giddens (1984), The Constitution of Society: Outline of the Theory of Structuration; Karl Marx (1844), Economic and Philosophic Manuscripts; Günter Ropohl (1979), Eine Systemtheorie der Technik: Zur Grundlegung der Allgemeinen Technologie.

methodological approaches for the historiography of railway system innovations. Nevertheless, they sometimes tend to neglect the contingency inherent to historical events and processes.

Because contingency inevitably results from underlying conditions which had been ignored by the agents, results from the scarcity of resources and from unintended consequences of actions: When the "Taktfahrplan" was designed, nobody would have foreseen that this system innovation was to be the base to construct Rail 2000 a dozen years later. Though, the adoption of an integrated fixed interval timetable created a distinctive path (and path dependence): The concept made sure that a massive enhancement of the train service could be attained with basically the same capacities in tracks and rolling stocks except for some extensions on the Bern-Zurich line like the Heitersberg-tunnel which went into construction in 1969 and the new line from Zurich main station to Zurich airport which had been designed in 1970. Rail 2000 followed this path by turning the traditional planning and production process upside down: a should-be-timetable was constructed on the base of market research and systemic conditions. Only then were the necessary instruments to create this "product" ordered: new tracks, rolling stock and the likes. Nevertheless, Rail 2000 was not only a software-oriented project like the smart slogan "electronics instead of traffic" had suggested. It relied partly on the new lines its precursor, the "New Main Rail Traverses" (NHT) had foreseen. When the four new lines agreed upon in the original Rail 2000 concept got reduced to only one new line, older paths of development like the one for a new interoperable high-speed train security and control system and the one for rail carriages with pendulum suspensions became important again.

This kind of reasoning opens a different way of how to approach the burning question for sociologists and historians of technology: Why did it not happen differently?[95] Why are there no "Shinkansen"-like high-speed trains in Switzerland? And what kind of technological and societal consequences does the ongoing automation of the railway system imply? The ongoing PhD-research-project will search more answers to these and related questions, which are to contribute a history of technology and of business at the Swiss Federal Railways in the last 40 years.

[95] Especially actor-network-theorists like Bruno Latour or Michel Callon advocate for an equal treatment of successful and failed inventions.