Employing Consumer IT in Operations: Will iPads Save Money, Increase Efficiency, and Raise User Satisfaction?

iPads and Trains

When, on a Monday morning in Autumn 2012, Erich Siegrist, head of technology architecture at the Swiss Federal Railways (SBB), started his day with a freshly poured and steaming cup of coffee and browsed through the newspaper on his iPad, he was reminded of the important meeting that he and his colleague Philip Büchler would have this week. Over the last couple of weeks, they had evaluated various ways to replace the now outdated laptop-based computer system that the nearly 3,000 train drivers at SBB were using. The importance of this project was substantial, given its scale and the fact that the new solution would be used to support the most central and operational task of the SBB: Driving trains on the railway system with the highest network load worldwide.

Besides its importance and scale, expectations of the new system from the business side were also exceptional. The objective was to cut device-operating costs by 75%, compared to the old laptop-based solution, increase the user satisfaction, and ultimately raise train driver efficiency. With conventional corporate IT devices, these aims seemed way beyond reach. But after evaluating several options, Siegrist and Büchler were convinced that they could meet these requirements after all, but with a device that was uncommon for a train cockpit: the Apple iPad.

This week, they would have their big day and present the outcome of the evaluation to a committee. If the committee were to turn down the proposed iPad-solution, Siegriest and Büchler would need to start all over again. But if they could convince the committee and the project turned out to be a success, they were sure that many comparable consumer-IT-related projects would follow, contributing to decreased IT costs and increased efficiency.

SBB faced increasing operational costs, with energy prices and railway maintenance costs steadily rising, making it more and more difficult to keep ticket prices at a reasonable level. Because SBB's transportation service is used by nearly a million passengers daily in a country with a population of about eight million, it was extremely important to increase SBB's operational efficiency through cutting-edge IT. But would consumer IT really turn

out to be an acceptable solution and could they really convince the committee to approve an iPad for an operational business task?

Switzerland and its Railway System

Switzerland is a country in Western Europe with about 8 million inhabitants. The countryside is dominated by the Alps, which cross the country from East to West. While the Alps occupy the greater part of the country, the Swiss population of approximately 8 million people is concentrated mostly in the part North of the Alps, where the largest cities are to be found. Among them are the two international cities and economic centers of Zürich and Geneva.[1][2]

The economic and political stability, transparent legal system, exceptional infrastructure, efficient capital markets, and low corporate tax rates make Switzerland one of the world's most competitive economies.[3] In particular, the country's high level of public mobility and its efficient transport infrastructure are two important elements of its economic success. Both are closely bound up with the railway system. Besides streets and highways, a rail network of about 3,000 km[1] and about 800 railway stations connect the major Swiss cities and their surrounding areas (see Exhibit 1). Almost all of the railway system is operated by Swiss Federal Railways (SBB), the most important railway and transportation company in Switzerland, which is active in all parts of the country: the German, French, and Italian-speaking parts. SBB's market share of total passenger traffic in Switzerland is 25% and 23% for freight traffic, which makes the company and railway traffic in general, one of the country's most important transportation providers. On average, SBB's passenger service is used by 967,000 passengers daily and 5 million customers per year. In 2010, 347.1 million passengers travelled with SBB and each Swiss resident traveled on average about 2,000 km by train.

Besides passengers, freight traffic is also remarkably high, with an average volume of 175,000 net tons per day. This considerable demand for railway transportation creates challengers concerning the network load. Compared to other countries, the Swiss railway network is the most heavily used in the world (see Exhibit 2), with an average of 151.2 trains passing each railway route per day (128.6 passenger trains; 25.7 freight trains). On weekdays, about 9,947 trains are on the network (8,078 passenger trains; 1,870 freight trains). To operate such a high network load, SBB wants to further reduce infrastructure problems and vehicle faults, and to ensure that operations run smoothly and are well coordinated. For example, the railway network is 100% electrified, which makes it more reliable (see Exhibit 3). But given that the network load had been increasing over the last few years (see Exhibit 4) and is expected to increase further, additional improvements and innovations will be necessary.

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[1] 1 km equals 0.6214 US miles

Swiss Federal Railways (SBB)

SBB is headquartered in Bern and is a special stock corporation with all shares held by the Swiss Confederation or the Swiss cantons. Nevertheless, it is managed entrepreneurially and in 2012, about 55% of the costs were covered by revenue. SBB is expected to meet a performance agreement, which is defined and updated every four years by the government. In its 2012 annual report, SBB lists the following nine corporate goals[4]:

1. Customer Satisfaction
2. Corporate Image
3. Staff Satisfaction
4. Customer Punctuality
5. Safety
6. Annual financial result
7. Cash Flow
8. Competitive Edge / Market Share
9. Environmental Sustainability

Overall, the SBB Group has 29,249 employees comprising 65 nationalities, with a full time equivalent (FTE) of 26,333[2] (see Exhibit 5). There are four divisions: Passenger, Freight (SBB Cargo) Infrastructure, and Real Estate.

The passenger division is concerned with the services related to passengers, while the freight division delivers services related to freight transportation. The maintenance, extension, and operation / controlling of the railway network is done by the infrastructure division. SBB's real estate division develops the company's stations and adjoining sites and manages SBB's properties.

Additionally, the group includes seven control and service functions (group-level services), such as (1) Finance, (2) Human Resources, (3) Safety, (4) Information Technology, (5) Communication and Public Affairs, (6) Corporate Development, and (7) Corporate Legal Services / Compliance (see Exhibit 6). The control and service functions are expected to support the four main divisions, which are basically internal clients to them.

Concerning FTEs, the passenger division is the largest division of the group, followed by infrastructure, freight, group-level services, and real estate (see Exhibit 5). The average age across SBB's employees is 43.9. In 2017, 30% of SBB's staff is expected to retire.[5]

SBB Passenger Division

SBB passenger transportation is one of the most important transportation service providers in Switzerland and used by nearly a million passengers per day. The passenger service is much appreciated and valued by customers, who display high satisfaction rates (see Exhibit 7). SBB also achieves high levels concerning the punctuality of train arrivals. About nine of ten passenger trains arrive at their destination with less than a 3-minute deviation from the timetable and 98.3% of all passengers catch their connecting trains (see Exhibit 8).

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[2] Average working hours per week are 42.5.

However, the division is experiencing several challenges in maintaining this high level of service, as energy prices and infrastructure costs rise constantly. In the 2012 annual report, it is stated that value for money and sufficient space are increasingly becoming an issue in customer satisfaction. Hence, SBB needs to keep innovating and making its service delivery / production more efficient.

Increasing Efficiency through IT

To keep pace with the increasing cost pressure, SBB invests heavily to increase operational efficiency. One means of increasing efficiency is to make tasks computer-supported. For example, SBB offers self-service ticket sales through tickets machines, their website and the SBB app. As a result, in 2012, 72,6% of all ticket purchases were self-serviced.

Also regarding internal tasks, SBB recently started projects such as the "paperless office" to increase the efficiency of their office-workers and achieve cost savings through reduced printing costs. The implementation of this initiative includes SBB executives and management roles being equipped with iPads. The intention is that users have all the information and documents at their fingertips in a very convenient and readable form, making it unnecessary to print documents and make handwritten notes. Besides office usage, the user-policy allows also private use of the device and unrestricted access to the app store.

But this initiative is only the first step towards SBB's vision of "connecting employees", aimed at enhancing communication by providing computer devices such as smartphones and media tablets to all SBB employees by 2014. In particular, the objective behind this vision is to provide all employees with one device that enables them to have an email account, access to the intranet, and other SBB-related information and applications (see Exhibit 15 and Exhibit 16). Besides enhancing communication and giving access to information, another aim of this initiative is to supply all employees with one device that they can use both on the job and privately (see Exhibit 17).

Apart from saving printing-costs and enhancing communication, another big issue is to increase task efficiency. Personnel expenses are still the biggest cost driver at SBB (see Exhibit 9) and total CHF 1,706 million per year for the passenger division. In terms of FTEs, the largest function of the passenger division is operations, with about 6,842 FTEs (see Exhibit 10). There are two major job profiles related to operations:

1. Train drivers (2,450 FTEs)
2. Train attendants (2,319 FTEs)

For both job profiles, different types of supporting IT devices have been introduced over the last decade. However, as with any computer device, these also face buying cycles and payout times. One of these solutions is LEA, the Lokführer[3] Electronic Assistant, which is an electronic assistant for train drivers.

LEA – Electronic Assistant for Train Drivers

The most important task for a train driver is to drive the train safely and according to the

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[3] "Lokführer" means "train driver" in German.

schedule. To perform this job effectively and efficiently, train drivers need several items of information, such as the train stations to approach, speed limits, details about railway works etc. This information is included in the operating instructions, which are customized for each trip. Due to the high network load of the railway system, the operating instructions are usually updated on a daily basis. To operate a train, train drivers therefore need to read the latest operating instruction right before their shifts as preparation, and refer to it from time to time during the trip.

Initially, the operating instructions were completely paper-based. But even in 2000, SBB introduced LEA, which is a software application that downloads and displays the latest operating instructions. It synchronizes the operating instructions before a trip and displays them according to the trip progress. In short, the application supports the train driver in preparing for the trip by downloading and displaying the instructions, and during the trip, by showing the information relevant for the current section of track.

Decreasing User Satisfaction, Increasing Costs

From an organizational perspective, solutions such as LEA are provided to the passenger division by the information technology (IT) department. The first generation, LEA 1, ran on a Psion netbook and was used from 2000 until 2007. In 2008, SBB introduced the second generation, LEA 2, which used a 15" Toshiba convertible touch notebook. These notebooks weight about 3kg[4] and use a desktop operating system (Microsoft Windows).

While LEA had so far been considered as an accepted and established solution, since 2011, the IT support team received an increasing number of complaints, concerning hardware issues and the bulky form of the device. Additionally, the field-support efforts were increasing and IT-support often needed to replace faulty devices. Given the fact that these devices already created running costs of about CHF 8 million per year, they seemed thoroughly outdated and unreasonably expensive. However, as LEA 2 had already been in use for about 5 years, the IT budget for 2013 included a provision for replacing LEA 2 with a new solution.

The Next Generation

When the new IT budget was published in autumn 2012 and sent to management, everyone seemed keen to know which projects would receive funding. Like all IT executives, Erich Siegrist, head of technology architecture, also browsed through the new budget and one item caught his attention: LEA 2 Replacement. He was very pleased to see that LEA would finally be replaced and he knew that his unit would be involved in the project. When it came to evaluating new IT solutions and developing concepts for integrating them into the existing IT infrastructure, the IT architecture team was in charge. With about 3,000 clients, LEA was a large-scale application and had high visibility inside SBB. Doing a good job with the LEA replacement would definitely enhance IT's reputation within SBB.

Therefore, Siegrist was excited about the project and right away took a first look at LEA 2's status. To get an initial overview, he looked at the complaints that IT support had received

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[4] About 6.6 lb.

from the train drivers. While reading the various statements, he realized that since the deployment of the second generation of LEA in 2008, user expectations of the device had clearly changed. There was a considerable number of complaints about the display quality, weight and mobility of the device. The old laptops really seemed extremely outdated, compared to the new devices. Also, from his own experiences, he knew that new consumer computer devices, such as the iPad, iPhone, Android tablets, had became increasingly popular and substantially outpaced common corporate IT devices in terms of usability, mobility, display quality, etc. It was also clear to him that many train drivers would already be using such devices privately and would therefore compare their corporate device with their private ones.

Siegrist decided that it would be best to start from scratch and gather the requirements for the new solution directly from the users and the passenger division management. Accordingly, he called together a committee, which included the head of train operations, representatives from the train drivers and labor union, and a team from IT to support the evaluation process. From his unit, Siegrist appointed Philip Büchler, Technology Manager Mobile, as the project leader.

After setting-up the project team and appointing the committee, the project had its kick-off meeting in autumn 2012, and, as expected, even the first meeting of the committee turned out to be very lively. All of the participants seemed to have very clear expectations of the next LEA generation. The head of train operations clearly stated that reducing costs was the highest priority and that running costs needed to be reduced to 2 million annually. On the other hand, the representatives of the users group also explained how important LEA is to their daily work and that they needed a reliable device, which is easy to use and very mobile. Train drivers usually have to carry the device with them when they leave work and do their preparation before they enter the cockpit of the train. A sufficient battery life and mobility, as well as good display readability, were therefore essential to them. IT added that connectivity would also be an issue, as the train drivers need to synchronize the latest instructions over the air before the shift. Therefore, as the discussion went on, it seemed more and more that the new benchmark for LEA 3 would indeed be new consumer devices, such as media tablets. However, when the discussion produced this conclusion, IT raised several concerns, as they were expected to integrate the device into the existing infrastructure. Given that the top priority was to reduce costs, changing the existing interfaces was not an option, as it would create excessively high expenses. The IT team therefore firmly stated that the new device would have to comply with the existing standards and interfaces, and support industry IT standards.

Collecting the requirements that emerged throughout the meeting, Büchler felt somehow caught between various competing objectives, namely simultaneously reducing costs, and increasing mobility, usability, hardware quality and ultimately user satisfaction. Furthermore, it was necessary to integrate a new solution that would meet these expectations without adding new standards or interfaces to the existing infrastructure. Besides these objectives, he also knew that the new solution would need to be secure and reliable. If the new devices could be hacked or infected by a virus, that would create considerable interference in the form of delays, missed stops, and both dissatisfied employees and customers.

Evaluating Devices

After the initial requirements had been collected, it was time to start with the actual evaluation. The aim of the evaluation was to select the right device, operating system and solution to port the application. To evaluate the different solutions, Büchler used a step-by-step approach. Firstly, he checked what devices were available on the market and grouped them into three device categories:

1. Industrial Devices (see Exhibit 12)
2. Laptop Computers (see Exhibit 13)
3. Media Tablets (see Exhibit 14)

In the next step, Büchler evaluated the expected running costs of devices. Regarding laptop computers and industry devices, it turned out that a significant reduction of the running costs could not be achieved with a full-feature desktop operating system. Desktop operating systems are associated with several service activities, such as patch management, virus protection, and software deployment. Therefore, cutting the running costs down to a target of 2 million did not seem achievable. However, from their experiences with iPads used by executives, he knew that a significant cut in running costs could be possible by using lightweight operating systems usually used on media tablets. Additionally, these tablets were much cheaper in terms of purchase price and their specifications would suite the purpose of the LEA application very well, namely displaying information. Battery life time, weight, start-up time also outpaced laptops.

But still, their experience in managing media tablets and employing them in operations was very limited. Also, it was unclear how the running costs would develop over the next few years. As consumer devices become more and more advanced, they could turn out to be as complex as desktop operating systems. Alongside with these concerns regarding the operating system, compatibility with the existing application was also unclear, which made it necessary to further evaluate the software.

Application

Applications that run on consumer device operating systems, so-called apps, are different to common desktop applications. The former use different technologies, are usually downloaded to the device through a central marketplace, called an app store, and can not usually be ported to a different operating system without considerable effort. In most cases, it is necessary to re-write existing applications to convert them into apps. But re-writing the entire LEA application was not an option in this case, as it would have meant exceeding the project budget.

However, the good thing about LEA was that it is mostly based on web-technologies. Other than standard desktop applications, web applications were compatible with many operating systems, in fact, nearly all operating systems that came with standard web browsers. As the latter were included in all media tablets in the market, the chances were good that there was still a way to easily adapt the existing application so that it would be compatible with consumer device operating systems.

But one problem still remained, namely connectivity. Web-technologies usually require an uninterrupted data connection to a server. While most of the time, trains have Internet access through 3G or their own data-network, uninterrupted data connectivity still cannot be guaranteed. Therefore, the app would need to synchronize the information before the trip and save it locally on the client device to ensure that it would be available during the entire trip.

To evaluate whether there was a solution to this issue, Büchler met with some colleagues from software development who had experience developing apps. Surprisingly, they assured him that with only a small effort, a hybrid app (a native app that captures and displays web-content) could be developed, which would indeed solve his problem. The hybrid app would use the existing web-based application and store the information locally on the device. When a data connection was available, it would update the information and store it locally, to make it available even if there was no data connection.

But how would the information be transferred securely to the device? To get some assistance on this issue, Büchler talked with his colleagues in network infrastructure. And also regarding this issue, there seemed to be a solution in place. His colleagues advised him that most media tablets support virtual private network (VPN) connections, which is a sufficient industry standard to secure a data connection.

After talking with his colleagues, who can be considered as experts in their work domains, Büchler was surprised how easily the porting of the exiting desktop application to an app seemed to be. As he trusted the advice of his colleagues, he concluded that from a technology point of view, using media tablets for LEA 3 was feasible.

Proposing a New Solution based on iPads

Büchler was confident that he had the information he needed to make a sound assessment of the available solutions. Therefore, he started assignung scores and explanations regarding the different requirements to the various products on the market, including media tablets and laptops. The outcome was that the only possible way to achieve the required cost cuttings, and still ensure high user satisfaction, was to employ some kind of media tablet. In particular, the assessment rated the Apple iPad highest, mostly because SBB already used it to support their executive levels. Therefore, the appropriate device management software had already been purchased and SBB already had some initial experiences with the device.

To present the outcome of his evaluation, Büchler prepared a slide deck and discussed the various issues and final solution with Siegrist. Siegrist was rather surprised at the outcome. Was the iPad, which was generally considered a high-end or even luxury device, the solution to reducing costs in an operational task? But after discussing the different options, Siegrist was also convinced that Büchler had done a good job and that his evaluation was comprehensive and correct. But would the committee also agree to their proposed solution?
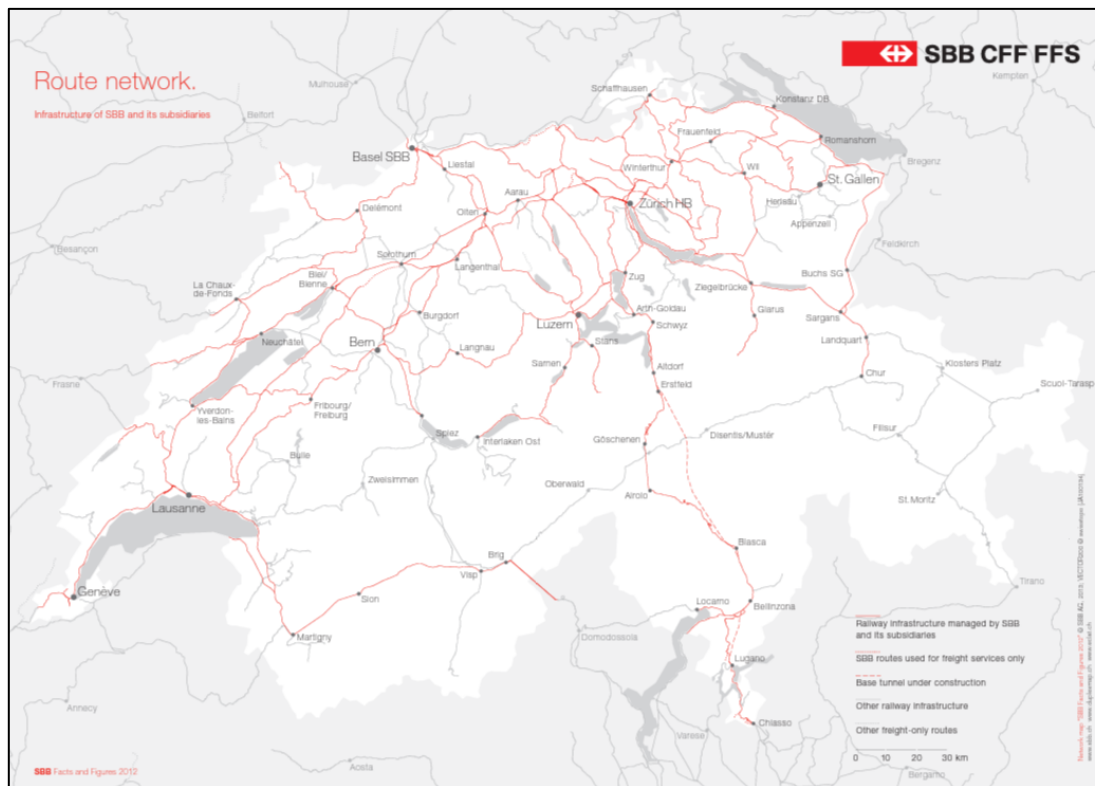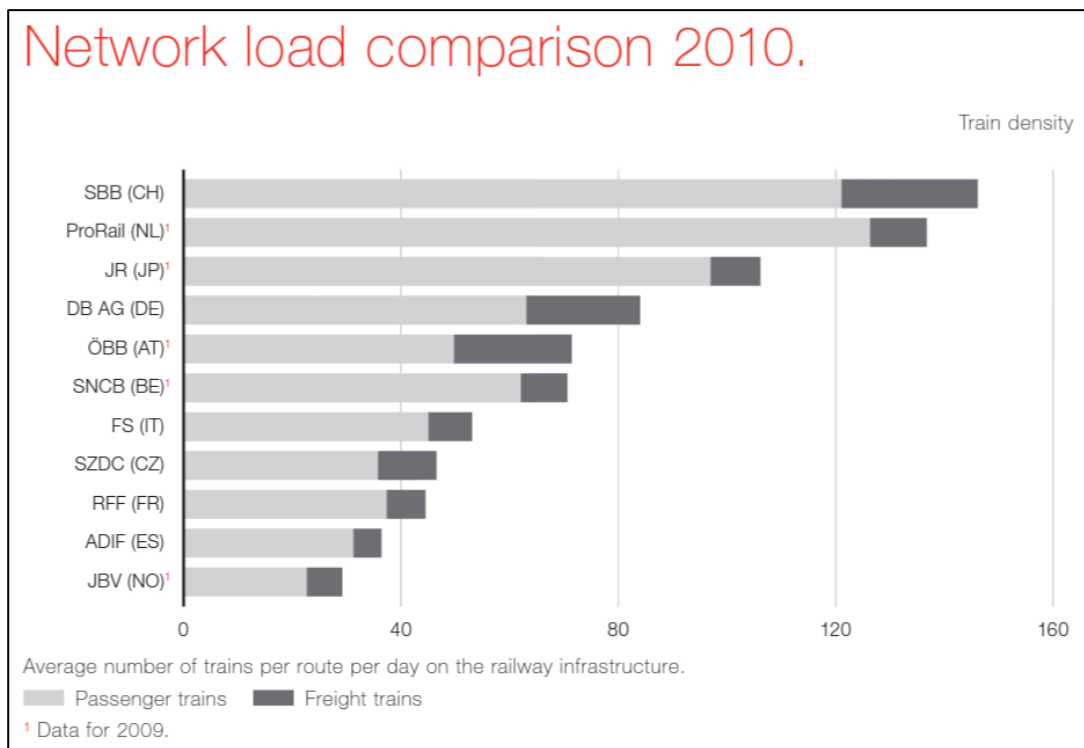
Tasks

1. Concerning SBB's passenger division, what are the major challenges the company and the division were facing? How and why could consumer IT contribute in solving these challenges?

2. From a technology perspective, the evaluation showed that iPads would be the first choice in this case. But how do you think the committee would react to the proposed solution? The committee includes the (1) head of train operations, (2) representatives from the train drivers and the (3) labor union, and a (4) team from IT with people from IT support, IT infrastructure, applications and IT architecture.

3. Before the new solution could be deployed, a usage policy needed to be defined and communicated. What are the pros and cons for different device usage policies regarding this solution (private usage yes/no, restricted access etc.)? Also discuss the implications for SBB's organizational culture.

4. The evaluation assumed that SBB would buy and own the devices. Consider whether a form of Bring Your Own Device (BYOD) policy could be also suitable?

5. Also the solution for the train attendees will be replaced in the next year and, due to the even higher mobility requirements, an iPad-based solution will be not suitable for that purpose. Accordingly, what are the implications for future decisions, if the train drivers receive iPads?

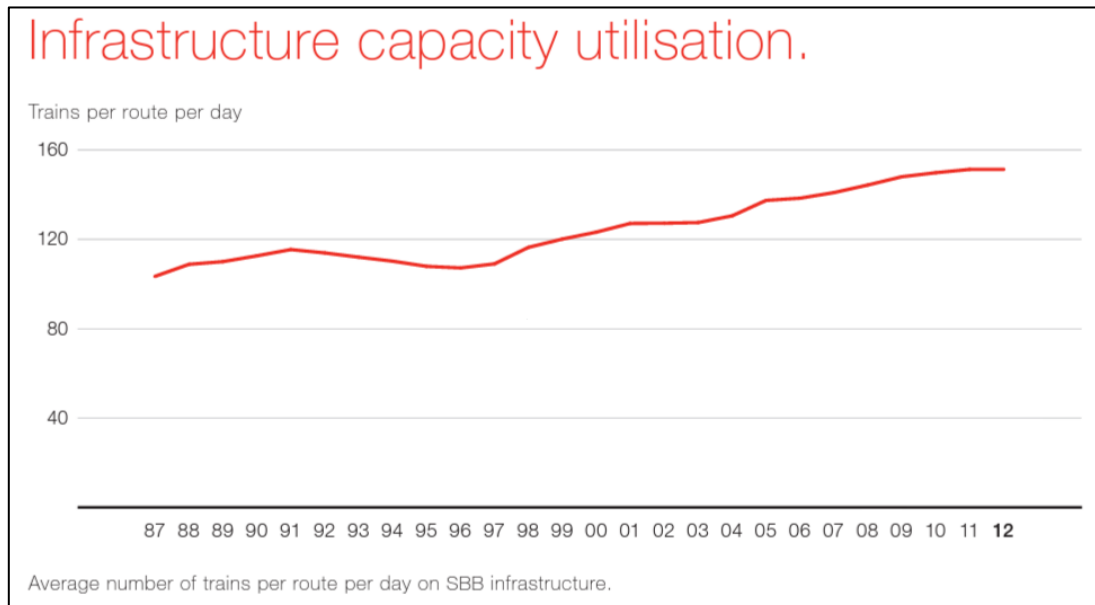## Exhibit 1: The Swiss railway system.[6]

Exhibit 2: Railway network load compared with other countries.[7]

Network load comparison 2010.

Train density

SBB (CH)	
ProRail (NL)[1]	
JR (JP)[1]	
DB AG (DE)	
ÖBB (AT)[1]	
SNCB (BE)[1]	
FS (IT)	
SZDC (CZ)	
RFF (FR)	
ADIF (ES)	
JBV (NO)[1]	

0   40   80   120   160

Average number of trains per route per day on the railway infrastructure.

■ Passenger trains   ■ Freight trains

[1] Data for 2009.

Exhibit 3: Comparison of railway companies.[8]

Comparison of railway companies 2010.[1]

| Company (RU/IM)[2]	Country	Routes km	Percentage electrified %	Headcount (RU+IM) FTE	Passenger-kilometres per inhabitant Pkm/inh.
CD/SZDC	Czech Republic	9,446	34	45,277	622
DB AG	Germany	33,707	59	251,810	961
FS	Italy	16,704	71	82,566	715
JR [3, 4]	Japan	20,035	61	128,761	1,910
NS/ProRail	Netherlands	3,016	70	13,809	925
NSB/JBV [4]	Norway	4,114	62	5,891	544
ÖBB	Austria	4,975	68	45,352	1,212
RENFE/ADIF	Spain	13,853	62	27,806	455
SBB	Switzerland	3,138	100	28,143	2,144
SNCB [4]	Belgium	3,578	84	37,130	968
SNCF/RFF	France	29,841	52	153,641	1,305

[1] Figures as per UIC statistics 2010, UIC synthesis 2010 and Eurostat 2012.   [2] RU: railway undertaking;
IM: infrastructure manager.   [3] Data for the seven regional successors to Japan Railways.   [4] Data for 2009.

Exhibit 4: Development of the infrastructure capacity utilization.[9]

Infrastructure capacity utilisation.

Trains per route per day

Average number of trains per route per day on SBB infrastructure.

Exhibit 5: Key figures on SBB personnel.[10]

Personnel.

		2003	2010	2011	**2012**	11/12 ± in %
Yearly average headcount (full-time equivalent)						
SBB AG and SBB Cargo AG	FTE	27,104	25,356	25,840	26,330	1.9
of which motive power unit drivers and train attendants		5,363	5,169	5,508	5,594	1.6
– Passenger		11,369	11,547	12,102	12,223	1.0
– Freight		4,851	3,129	2,981	2,812	−5.7
– Infrastructure		9,469	8,746	8,752	8,985	2.7
– Real Estate		790	740	752	767	2.1
– Group-level services [1]		625	1,194	1,253	1,543	23.2
Subsidiaries		1,603	2,787	2,745	2,910	6.0
Total		28,707	28,143	28,586	**29,240**	2.3
Training and reorientation						
Training positions filled by "login"	FTE	1,077	1,278	1,297	1,337	3.1
Labour market centre		163	186	158	156	−1.6
Key personnel figures [2]						
Female employees	% employees	10.2	14.5	15.1	15.8	0.7
New employees	% FTE	3.8	6.6	8.4	8.3	−0.1
Non-Swiss employees		10.6	11.9	12.3	13.0	6.0
Overall staff satisfaction [3]	Index (1–100)	62	58	60	62	3.3

Exhibit 6: Organizational structure of SBB.[11]
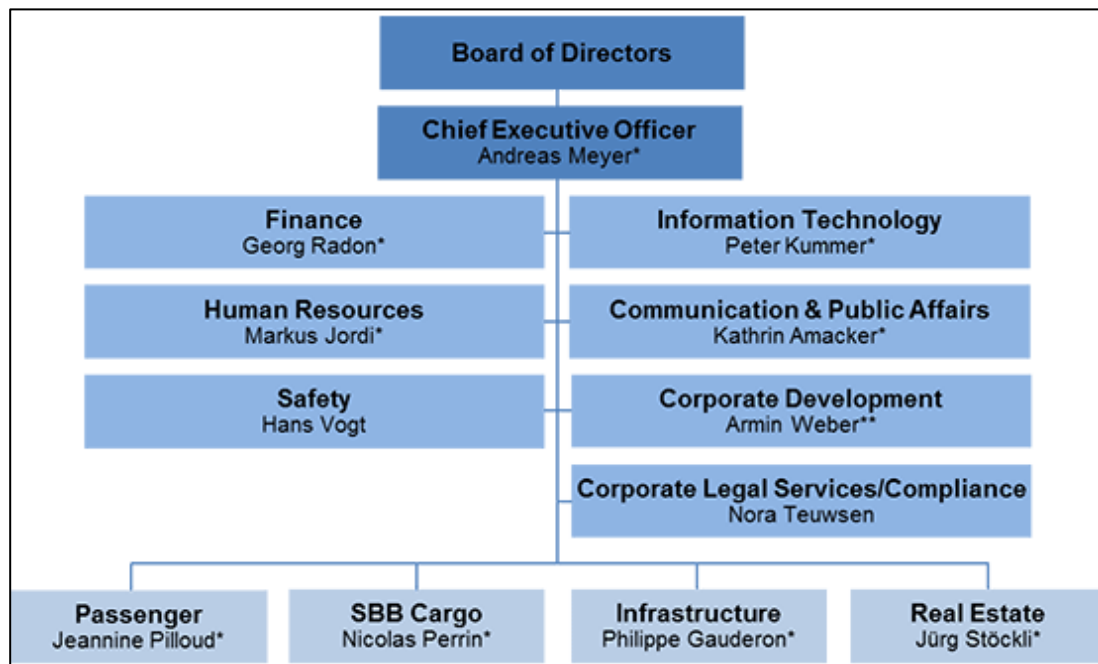
Exhibit 7: Customer satisfaction for passenger division.[12]

Exhibit 8: Punctuality for passenger division.[13]
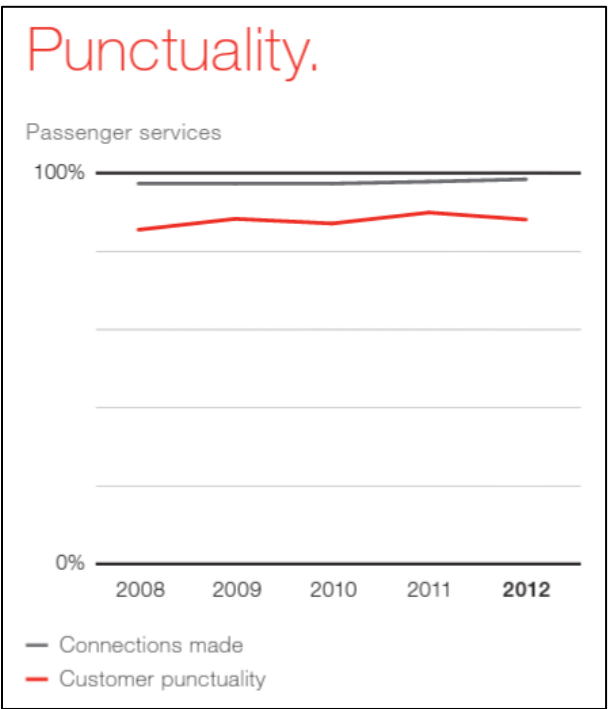
Exhibit 9: Break-down of SBB's operating costs.[14]
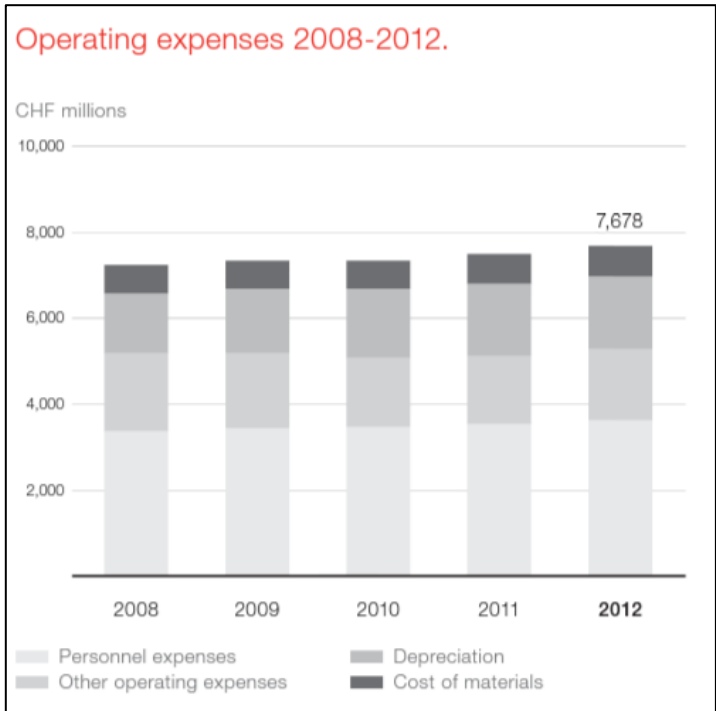
Exhibit 10: Personnel structure of the passenger divison.[15]

Personnel.

Yearly average headcount (full-time equivalent)		2003	2010	2011	**2012**	11/12 ± in %
SBB AG, Passenger Division	FTE	11,369	11,547	12,102	12,223	1.0
– Central administration		[918]	[1,165]	695	602	−13.3
– Sales and customer service		[1,832]	[1,871]	1,886	1,859	−1.4
– Operations/production		[6,546]	[5,608]	6,631	6,842	3.2
of which motive power unit drivers		2,450	2,274	2,451	2,450	0.0
of which train attendants		1,662	2,040	2,199	2,319	5.5
– Technicians/maintenance		[1,719]	[2,578]	2,891	2,920	1.0
of which rolling stock maintenance		1,630	2,094	2,181	2,209	1.3
– Other [1]		354	325	–	–	–
Subsidiaries		1,239	1,884	1,746	1,761	0.9
Total		12,608	13,431	13,848	**13,984**	1.0

Exhibit 11: Income statement of the passenger division.[16]

1 January to 31 December.

CHF millions	Passenger 2012	2011
Income statement		
Operating income	**4,543.1**	4,431.2
of which		
– Traffic revenues	2,879.9	2,812.1
– Public-sector funding	640.3	612.7
– Rental income from real estate	9.4	28.2
Operating expenses	**−4,206.0**	−4,117.0
of which		
– Personnel expenses	−1,706.6	−1,680.1
– Depreciation	−523.8	−510.7
– Rail-related operating expenses	−823.0	−790.9
Operating result/EBIT	**337.1**	314.2
Other income	−68.2	−100.3
Compensation payments Infrastructure/PF loan	0.0	0.0
Consolidated net income	**268.9**	213.9

Exhibit 12: Example for an industrial computer device.[17]

Exhibit 13: Example for a laptop computer.[18]
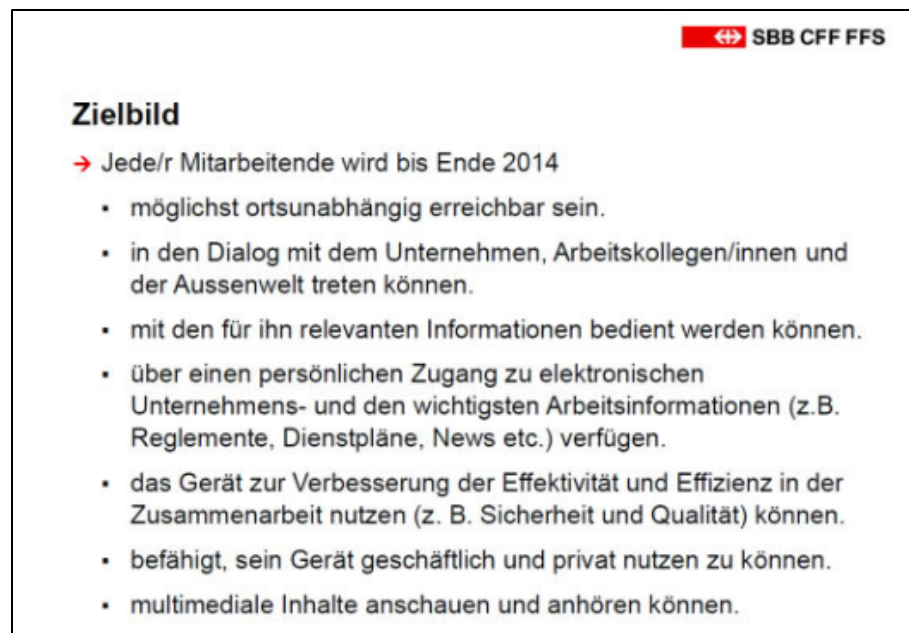
Exhibit 14: Examples for media tablets.[19]

Exhibit 15: SBB's strategic initiative "Mitarbeitende verbinden".[20]

Exhibit 16: Parts of the initiative.[21]

Exhibit 17: Goals of the initiative.[22]

Endnotes

[1] CIA Word Factbook: https://www.cia.gov/library/publications/the-world-factbook/geos/sz.html

[2] Article about Switzerland on Wikipedia: http://en.wikipedia.org/wiki/Switzerland

[3] CIA Word Factbook: https://www.cia.gov/library/publications/the-world-factbook/geos/sz.html

[4] Annual Report 2012 (German): http://goo.gl/gojyng

[5] SBB Annual Report 2012 (German): http://goo.gl/gojyng

[6] SBB Facts and Figures 2012: http://goo.gl/J3Hv4y

[7] SBB Facts and Figures 2012: http://goo.gl/J3Hv4y

[8] SBB Facts and Figures 2012: http://goo.gl/J3Hv4y

[9] SBB Facts and Figures 2012: http://goo.gl/J3Hv4y

[10] SBB Facts and Figures 2012: http://goo.gl/J3Hv4y

[11] SBB Facts and Figures 2012: http://goo.gl/J3Hv4y

[12] SBB Facts and Figures 2012: http://goo.gl/J3Hv4y

[13] SBB Facts and Figures 2012: http://goo.gl/J3Hv4y

[14] SBB Financial Position 2012: http://goo.gl/mg0N7B

[15] SBB Facts and Figures 2012: http://goo.gl/J3Hv4y

[16] SBB Financial Position 2012: http://goo.gl/mg0N7B

[17] Picture retrieved from:
http://www.nextpoints.com/media/k2/items/cache/0692a4e584defe6544ca2abbf7dd2502_XL.jpg

[18] Picture retrieved from:
http://www.custom-build-computers.com/image-files/hp-laptop-computers-repairs.jpg

[19] Picture retrieved from:
http://ithinkink.files.wordpress.com/2012/06/tablets.jpg

[20] Newspaper article on SBB's strategic initiative "Mitarbeitende verbinden" (German):
http://www.20min.ch/digital/news/story/19564482#

[21] Newspaper article on SBB's strategic initiative "Mitarbeitende verbinden" (German):
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[22] Newspaper article on SBB's strategic initiative "Mitarbeitende verbinden" (German):
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