

Switzerland's Digital Future

Facts, Challenges, Recommendations

EPFL College of Management of Technology

Impressum

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Executive summary

The world is changing rapidly and the business mix of entire countries is evolving to meet that changing world. However, this evolution is happening unevenly in different countries and regions around the world. The original motivation for this research project was provided by the report, “The Future of the Networked Society,” published last year by the Gottlieb Duttweiler Institute (GDI). It was a foresight and technology forecasting exercise that described different scenarios for Switzerland’s digital future. The purpose of this report is twofold: to clearly describe Switzerland’s current situation, especially in comparison to other potential leaders in a not so far off digital future; to provide recommendations that would enable Switzerland to become a leader in a variety of different sectors.

In our research, it quickly became apparent that Switzerland—while recognized as one of the world’s most competitive economies and a leader in many sectors—is not well known for its information technology sector or for its influence in the digital economy realm. Therefore, this report helps clarify where Switzerland as a country and its companies are at this moment in the digital space, and the conditions—including socio-economic conditions—under which Switzerland can benefit from future technological developments. It contributes to the debate on the digitalization of the economy and how that relates to the socio-economic conditions mentioned above.

Switzerland’s digital future will depend on a complex confluence of several interrelated factors. Citizens, policy makers, and entrepreneurs at the local and global level, all play important roles. What we have aimed to do in this report is focus on five current trends in digitalization: digital infrastructure, startup ecosystems, data governance, the digitalization of the public sector, and societal trends, and identify Switzerland’s strengths and weaknesses compared to other countries in the world. Based on our research and a series of interviews we conducted with experts, we crafted a number of recommendations that would help Switzerland become a world leader (where it is not already) and continue to grow in areas where it is already well established.

Each chapter includes a dashboard that provides, at a glance, a comparison of Switzerland and the leading countries in each area. Each chapter also includes a list of recommendations. We have identified a few key areas where Switzerland could lead in terms of digitalization. Some of these areas, such as Fintech, are emerging fields where Switzerland could exploit its historical standing to become the one to follow. In other areas, like startup ecosystems, Switzerland has the opportunity to play the game its way, instead of playing by other countries’ rules.

There are, of course, barriers to achieving success and becoming a major player on the world stage. Some of these barriers are not specifically Swiss, such as digital readiness. Others have a Swiss flavor, but are present in countries around the world, such as immigration. And others, namely investment mechanisms and taxation, are dependent on a specific Swiss context.

We hope that taken together, our assessment of Switzerland's current position and our recommendations will propel Switzerland to a leadership position in the global digital economy and keep it there for a long time to come.

Summary of chapters:

- Chapter 2: In *Infrastructure*, Switzerland has a strength in *ICT access*, particularly with regard to fixed Internet connections, International Internet bandwidth per Internet user (bit/s), and network support for the Internet of Things (IoT), smart cities, and energy efficiency; whereas *ICT use* presents a weakness for Switzerland in terms of mobility and especially mobile broadband.
- Chapter 3: In *data governance*, at the global level, Switzerland is strong in privacy and data protection, because of its legal framework and constitution but also thanks to its infrastructure, which guarantees highly ranked server security. Consequently, Switzerland is well placed to be a very strong player in the data center market and a trusted place to host data.
- Chapter 4: Switzerland is consistently ranked among the most competitive economies in the world and the most innovative. The country has a highly skilled workforce and enrollment in tertiary education continues to grow. There is still room for improvement in terms of startup ecosystems, however. Namely, changes in funding and taxing startups would help to make the country more attractive to creative, tech-oriented companies. No Swiss city is listed in the international rankings of startup ecosystems and only eight Swiss companies make it onto the list of the top 5000 European new businesses.
- Chapter 5: Regarding *Institutions*, Switzerland has strengths at the global level in property rights, political stability, and reliability of institutions; whereas digital governance is currently a weakness due to the delays in government online service development and a low degree of e-participation; E-participation, however, is probably less important because of the high degree of participation through traditional channels, unlike in other countries.
- Chapter 6: Switzerland is consistently ranked among the countries with the highest quality of life. Unemployment is low, salaries are high, and life satisfaction is one of the highest in the OECD. By all accounts, Switzerland is an excellent place to live. In terms of digital readiness, however, there is room for growth. As services (public and private) and consumption activities move online, digital readiness takes on new importance. This is one area where Switzerland can improve by increasing the overall digital literacy of its population. A more digital literate society, coupled with effective data security laws should see an increase in trust in data-sharing, which will become more common in coming years.
- Chapter 7: We focus on key areas where Switzerland could lead in terms of digitalization. Some of these areas, such as Fintech, are emerging fields where Switzerland could exploit

its historical standing to become the one to follow. In other areas, like startup ecosystems, Switzerland has the opportunity to play the game its way, instead of playing by someone else's rules. There are, of course, barriers to achieving success and becoming a major player on the world stage. Some of these barriers are not specifically Swiss, such as digital readiness. Others have a Swiss flavor, but are present in countries around the world, such as immigration. And others, namely investment mechanisms and taxation, are dependent on a specific Swiss context.

Key Recommendations:

- Increase private and public infrastructure investments in mobile broadband, as the trend toward digitalization means to be increasingly connected at all times, including—or maybe even especially—while outside the home or office, while companies worldwide are adding mobile offerings and exploring mobile business models at a rapid pace.
- Promote the attractiveness of Switzerland's infrastructure for finance-oriented digital infrastructure, as it builds on Switzerland's reputation in finance while making the bridge to the digital economy.
- Improve and promote the attractiveness of Switzerland as *the* global secure trusted center for corporate and individual data, building on Switzerland's reputation for safety, security, and privacy while also making a bridge to the digital economy.
- Work with Cantons to help them understand that current taxation policies, in which startups are taxed based on their external valuation, are potentially detrimental to the Swiss startup ecosystem. Currently, when external investors make an investment that increases the value of the company, the founders often incur a large tax bill that cannot be deferred. Thus the most successful companies (the ones whose valuations are growing the most quickly) have incentives to set up operations outside Switzerland while they are raising funds.
- Introduce funding mechanisms that fill the gap between seed money and large investments. Given the long idea-to-market cycle, this is especially important in Switzerland.
- Identify business models for the exploitation of open government data providing shared value to businesses and public administration.
- Pursue digital literacy programs, both formal and informal, which increase the population's ability to effectively use digital devices, implying more openness to a digital future with more services moving online, a more dynamic digital economy, and more participation in online culture.
- If possible, reduce constraints on immigration of highly skilled workers, and develop positive marketing messages that they will be welcome here.

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Chapter 1 Introduction

With the popularization of the Internet over the last 25 years, business and society have witnessed massive changes. Starting with companies adding an extra sales channel (e-commerce) to governments seeking to streamline bureaucracy to digital distribution of information goods to online product development to social networks to crowdsourcing and crowdfunding, the potential of digitalization is vast. More recently, big data analysis of passive crowdsourcing based on mobile phone GPS data, “Internet of Things” sensors, social network posts, and customer behavior has led to keen insights about citizen / consumer preferences, habits, and even the spread of contagious diseases, but also sounded a warning signal about the tracking and tracing of individual movements and opinions and the erosion of individual privacy rights.

The world is changing rapidly and the business mix of entire countries is evolving to meet that changing world. However, this evolution is happening unevenly in different countries and regions around the world. The original motivation for this research project was provided by the report, “The Future of the Networked Society,” published last year by the Gottlieb Duttweiler Institute (GDI). It was a foresight and technology forecasting exercise that described different scenarios for Switzerland’s digital future. The scenarios were based on the different levels of citizens’ control over their data, combined with different levels of economic growth. The “rosiest” scenario was called *Dynamic Freedom* in which the economy was robust and growing, providing much economic opportunity, while at the same time, citizens enjoyed high control over their own data. This original motivation led us to think more generally about Switzerland’s potential role as a leader in a future that was looking increasingly digitally-enabled and -oriented.

We started to wonder what it would take to bring about the situation of Switzerland being in such a leadership position and quickly came to the conclusion that such a future involved a complex confluence of several interrelated factors. First was the physical infrastructure that underlies any country’s ability to safely store and transmit information. Second were the conditions for startups—especially high-potential and ambitious technology-oriented startups—whose innovations often fuel economic growth. And third were national, regional, and local institutions, for example, the legal system, the educational system, and so forth, which enable or constrain a whole host of developments, including data privacy laws, pro-innovation regulations, tax treatment of technology entrepreneurs, and the openness of government data sources. There could be several other factors enabling digital leadership for Switzerland but due to the consensus established in our data collection (see below), we decided to focus on these in this report.

In our research, it came out right away that Switzerland—while well known as one of the world’s most competitive economies and a leader in many sectors—is not famous for its information technology sector or for its influence in the digital economy realm. Several experts lamented the

lack of Swiss leadership in the digital realm, some arguing that Switzerland should “play the US game” better while others argued equally passionately that Switzerland should develop its own game. What is clear is that the *status quo* will not lead to Swiss leadership in the digital economy and probably not to *Dynamic Freedom*, either. How could it if large US corporations control individuals’ data from all over the world without much accountability to Swiss institutions?

Therefore, this report helps clarify where Switzerland as a country and its companies are at this moment in the digital space, and the conditions—including socio-economic conditions—under which Switzerland can benefit from future technological developments. It contributes to the debate on the digitalization of the economy and how that relates to the socio-economic conditions mentioned above, providing a basis for formulating recommendations.

1.1 Methodology

The research for this report was conducted over a six-month period and data were triangulated from multiple sources. We started with our own knowledge repository and research in the areas of information technology strategy, innovation management, e-government, crowdsourcing, and social media studies, and supplemented that with published articles and reports on digitalization of the economy, open government, pro-innovation regulation, Fintech, and international comparisons of competitiveness and IT infrastructure.

We then convened a workshop at EPFL of sixteen participants, involving both people from industry involved in digitalization, infrastructure, telecommunications, Fintech, and entrepreneurship, as well as academic researchers mainly from EPFL in management, information systems, computer science, transport, entrepreneurship, and digital humanities. The dialogues and presentations from the workshop were transcribed and analyzed using content analysis techniques. We visited several technology companies and learned about their digital innovation strategies. We then conducted a series of 12 interviews with experts in the fields mentioned above. The interviews lasted at least one hour and were taped, transcribed, and analyzed using content analysis techniques. In this way, we were able to solicit a variety of views on Switzerland’s future development as a digital hub and competitive economy.

By content analysis techniques, we are referring to qualitative data analysis techniques that involve coding of topics and keywords. Patterns are sought in the topics and a hierarchical tree structure of the topics is developed to better understand the main themes and concerns of the participants and interviewees and how those themes relate to each other. Thus we were looking for topics, ideas, and suggestions that spanned several sources.

We also gained access to the underlying data from various competitiveness surveys and studies so that we could examine some of the components of the aggregate indexes. In this way we are able to gain insight on some of the more digital aspects of the surveys. In some cases, different components are added together to come up with aggregate measures, and some of these aggregates

can obscure interesting details about the digital readiness of different countries, including Switzerland.

At the end of our analysis phase, we used our own expertise and experience to propose recommendations, which we then presented to third parties with expertise in different areas represented by this report to make sure that the recommendations flowed from the analysis and was consistent with the goals and scope of this document.

1.2 Structure of the document

The document is structured as follows. The report is an extensive analysis of Switzerland's current position in the process of digitalization of the economy, and where it stands relative to other countries in Europe and the rest of the world. We start (Chapter 2) by describing the information and communications technology (ICT) infrastructure in Switzerland and how it relates to several sectors of the economy most likely to be influenced by future trends in digitalization. We then move on (Chapter 3) to data governance and privacy issues and discuss how those are evolving. Then we present (Chapter 4) major characteristics, trends, and challenges in the Swiss entrepreneurial ecosystem, followed by a discussion (Chapter 5) of the public sector in Switzerland with regard to digital economy and how that compares both within Europe and worldwide as well. We then continue with a brief discussion (Chapter 6) on cultural norms in Switzerland and how they compare with other major countries.

The next chapter (Chapter 7) outlines the importance of digitalization, the opportunities inherent in embracing it, and the risks of both doing so and also of not embracing it. We describe the link between research and innovation in Switzerland and how that might be an enabler of Swiss leadership in digital economy. We then summarize and discuss the key factors that would most likely need to be in place for Switzerland to continue to be known as one of the most competitive economies in the world, albeit in a different future world that is much more ICT-oriented than our current one. We end the report with conclusions and a summary of the recommendations in the various dimensions explored in the earlier parts of the report.

Chapter 2 Network infrastructure: Switzerland's relative position

Digital technologies are gaining a strong influence over the infrastructure needs of business and society, enforcing new forms of organizations and coordination among diverse actors as well as between the layers accessible to final users and the existing information and communications technology (ICT) infrastructure.¹ This infrastructure is a key resource for the delivery of digital products and services, which need to be compliant with the standard protocols of global connectivity, while at the same time, digital goods and services need to be appropriately linked to the ICT infrastructure, which should be configured and adapted to satisfy the needs for agility, flexibility, and efficiency of digital business.²

In this chapter, we compare Switzerland's position along many dimensions of digitalization with reference countries selected from among the leaders in each dimension. In other words, we create a list of strong performers in each dimension and then combine all the lists into one reference group. This method provides a good idea where Switzerland is relative to the leadership position in each dimension and how far behind the leader it is, if at all (in several cases, Switzerland is already the leader).

Network infrastructure usually refers to the information and communication technologies (hardware and software resources) that enable the connectivity, communication, information exchange of a single or a network of organizations, either public or private.³ In addition, at a different scale, network infrastructure can be seen as the ICT backbone of a given country.

We present comparisons with several European and non-European countries. The reference countries have been selected on the basis of their ranking among the top ten best performers in the indexes, as explained above. Specific attention is dedicated to Israel because of its performance in digital entrepreneurship as shown in Section 2.2 below.⁴ In what follows, we examine the strengths and challenges of Switzerland with regard to its network infrastructure considering a set of index and indicators from, among others:

¹ Bharadwaj et al. 2013

² Grebe et al. 2016

³ techopedia 2016

⁴ See also Senor and Singer (2009)

-
- *The Global Competitiveness Report 2015–2016* published by the World Economic Forum⁵—**WEF** in what follows.
 - *The Global Innovation Index 2015: published by* Cornell University, INSEAD, and the World Intellectual Property Organization (WIPO)—**GII** in what follows.⁶
 - *The “Measuring the Information Society Report 2014 and 2015”* by the International Telecommunications Union (**ITU** in what follows).

One of the main “pillars” of the GII is called *Infrastructure* (the others being *Institutions*, *Human capital and research*, *Market sophistication*, and *Business sophistication*). The GII infrastructure pillar is further subdivided three sub-pillars: *Information and communication technologies (ICTs)*, *General infrastructure*, and *Ecological sustainability*. In this section, we consider two sub-indexes for ICTs, i.e., the *ICT access index* and the *ICT use index*. It is worth noting that two other sub-indexes for ICTs (*Government’s online service* and *Online e-participation*) will be analyzed in Chapter 5 under Public Sector performance. Regarding the GII, the *ICT access sub-index* is a composite index⁷ that weights five ICT indicators (20% each):

- (1) Fixed telephone lines per 100 inhabitants;
- (2) Mobile cellular telephone subscriptions per 100 inhabitants;
- (3) International Internet bandwidth (bit/s) per Internet user;
- (4) Percentage of households with a computer; and
- (5) Percentage of households with Internet access. As pointed out by Dutta et al. (2015), this also represents the first sub-index in ITU’s ICT Development Index (IDI).

The *ICT use index* is a composite index that weights three ICT indicators (1/3 each):

- (1) Percentage of individuals using the Internet;
- (2) Fixed (wired) broadband Internet subscriptions per 100 inhabitants; and
- (3) Active mobile broadband subscriptions per 100 inhabitants.

As pointed out by Dutta et al. (2015), the *ICT use index* is also the second sub-index in the ITU’s *ICT Development Index (IDI)*,⁸ which will be analyzed next.

⁵ Schwab 2015

⁶ Dutta et al. 2015

⁷ Dutta et al. 2015

⁸ See also International Telecommunication Union (ITU) 2014, 2015

2.1 The global context

Let us start with the good news: According to the ITU's ICT Development Index, Switzerland ranks #7 at the global level, moving up five positions since 2010. However, by looking at the different sub-indexes mentioned above summarized in Table 1, we see that Switzerland is currently ranked #15 for the infrastructure pillar according to GII. Furthermore, Switzerland is not among the top ten countries for the ICT sub-pillar, currently ranking #41 at the global level. The difference in the ranking partially depends on the inclusion by the GII 2015 of the *Government's online service* and *Online e-participation* indexes, which represent a weakness for Switzerland (discussed further in Chapter 5)

Table 1. Infrastructure index and sub dimension rankings for Switzerland and selected countries at the global level, adapted from Dutta et al. (2015). Green cells indicate countries ranked #1 in the GII, while grey-colored cells represent the top ten countries per index.

Index	Switzerland	Singapore	China	Hong Kong	Australia	Japan	Israel	Republic of Korea	USA
Infrastructure	15	1	32	2	4	5	26	7	14
Information & communication technologies (ICTs)	41	6	54	9	7	4	13	1	8
ICT access	2	13	77	4	20	14	16	8	28
ICT use	18	11	71	13	11	7	30	3	10

This is particularly relevant when considering that Singapore and the Republic of Korea (South Korea), ranked first for the Infrastructure pillar and the ICTs sub-pillar respectively. The *Government's online service* and *Online e-participation* indexes represent the main strength for Singapore and a significant one for South Korea. Korea can also count also on ICT use as a strength, coupled with a top ten ranking for ICT access.

Drilling down into ICT access and use, we now consider some figures from the ICT Development Index (IDI) 2015, which provide a perspective on ICT access and use not influenced by the two GII indexes related to government services and consultation-related initiatives. In particular, Table 2 shows the ranking for Switzerland, Singapore, South Korea, and Israel, also for the dimensions comprising the two indexes. The countries have been selected on the basis of their similarity to Switzerland in terms of population (7,822,107 for Israel and 5,517,102 for Singapore), their ranking first in the pillars shown in Table 2 (Singapore and South Korea), and the promotion of digital innovation through start-ups (Israel, also among the GII 2015 top performers for the Northern Africa and Western Asia Region as well as at the global level for R&D expenditure as a share of GDP).

Considering the IDI Access Sub-Index, while Switzerland looks good overall, as in the case of the GII 2015, other countries have higher scores in the individual sub-indexes, for example, Singapore

performs better with regard to mobile-cellular telephone subscriptions per 100 inhabitants (158.13) and South Korea for fixed-telephone subscriptions per 100 inhabitants (59.54).

Table 2. IDI Access and Use Sub-Index for Switzerland, Singapore, South Korea, and Israel, adapted from International Telecommunication Union (ITU), 2015.

<i>Index and dimensions</i>	<i>Country</i>			
	Switzerland	Singapore	Republic of Korea	Israel
IDI Access Sub-Index	6	8.64	9.00	7.98
Fixed-telephone subscriptions per 100 inhabitants	53.62	35.52	59.54	37.07
Mobile-cellular telephone subscriptions per 100 inhabitants	140.54	158.13	115.54	121.45
International internet bandwidth per Internet user (Bit/s)	352,243	616,531	43,358	98,409
Percentage of households with computer	87.56	88.00	78.25	82.40
Percentage of households with Internet access	90.60	88.00	98.49	71.50
IDI Use Sub-Index	8	7.61	8.42	5.57
Percentage of individuals using the Internet	87.00	82.00	87.87	71.45
Fixed (wired) broadband subscriptions per 100 inhabitants	45.97	27.79	38.78	26.18
Active mobile broadband subscriptions per 100 inhabitants	76.61	156.15	108.56	52.16

Looking now at the IDI Use Sub-Index, South Korea is still leading (8.42) even if only marginally with regard to Switzerland (8), which is by far leading in Fixed (wired) broadband subscriptions per 100 inhabitants (45.97).

Key case - Swisscom and the Internet of Things: Swisscom is deploying a nationwide network to support the “Internet of Things,” (IoT) with the initial rollout scheduled for the end of 2016. The network will use technology based on the Low Power Wide Area Network standard from the LoRa Alliance, a basis for IoTs, smart cities, energy efficient buildings, machine-to-machine networking, and digital applications. As reported by RCR Wireless News (Tomás 2016) the offering will be increased through existing base stations, aiming to cover 80% of the country’s outdoor and partial indoor population of ten Swiss cities by the end of 2016. The Network operates on the unlicensed SRD band and transmits information at a maximum of 0.5 watts. The goal is to support with a combination of various networks with individual characteristics the applications that in the near future are supposed to use mobile networks with high data requirements (for example cars, remote maintenance or real-time control systems).

Switzerland has also a strength in International Internet bandwidth per Internet user (352,243).⁹ Despite that, Switzerland presents weakness with regard to active mobile broadband subscriptions per 100 inhabitants (76.61), a large gap relative to Singapore (156.15) and South Korea (108.56). Yet, it is worth noting that the performance of Switzerland in mobile-broadband subscriptions is influenced by the costs for mobile networking that are 45 to 129 per cent higher than neighboring countries (Germany, France, Austria, and Italy) as well as the country's topological and geographical characteristics. According to Price Waterhouse Coopers,¹⁰ the following activities and costs are considered relevant and subject to regulatory compliance: authorization for building a site; authorization for operating a site and transmitting; electromagnetic field measurement; legal costs related to authorizations that are often subject to litigation, supervision costs (e.g. for information exchange); and labor costs.

In particular, it is worth noting the strict regulation of non-ionizing radiation (NIR), i.e., exposure and installation limits, the worst-case principle, and the prescribed measurement method.¹¹ According to PwC (pwc 2013), Switzerland is the only country among the neighboring countries requiring a continuous monitoring system to check that all technical parameters that have an influence on NIR exposure levels do not exceed the established official value.

2.2 The European context

According to the ITU's IDI, Switzerland ranks #7 at the European level, too, likewise moving up five positions since 2010. Yet, an examination of

Table 3, which demonstrates relative rankings, indicates that in the GII 2015, Switzerland is again ranked #15 for the infrastructure pillar. Furthermore, Switzerland is not among the top ten countries for the ICT sub-pillar, currently ranking #41 at the European level.

In this case, the difference in the ranking again partially depends on the inclusion by the GII 2015 of the *Government's online service* and *Online e-participation* indexes. Indeed, the *Government's online service* and *Online e-participation* indexes represent the main strength for France and a significant one for the UK and the Netherlands (both having e-participation as a strength).

⁹ According to the International Telecommunication Union (ITU, 2015), International Internet bandwidth refers to the total used capacity of international Internet bandwidth, in megabits per second (Mbit/s). Used international Internet bandwidth refers to the average traffic load of international fiber-optic cables and radio links for carrying Internet traffic. The average is calculated over the 12-month period of the reference year, and takes into consideration the traffic of all international Internet links. If the traffic is asymmetric, i.e., if there is more incoming (downlink) than outgoing (uplink) traffic, the average incoming (downlink) traffic load is used. The combined average traffic load of different international Internet links can be reported as the sum of the average traffic loads of the individual links. International Internet bandwidth (bit/s) per Internet user is calculated by converting to bits per second and dividing by the total number of Internet users.

¹⁰ PwC (pwc 2013)

¹¹ pwc 2013

Table 3. Infrastructure index and sub dimensions for Switzerland and selected countries at the European level, adapted from Dutta et al. (2015). Green cells indicate countries ranked #1 by the GII, while grey-colored cells refer to top ten countries per index.

Index	Switzerland	Norway	The UK	Sweden	Spain	Estonia	France	The Netherlands	Finland	Denmark	Germany	Luxembourg	Iceland
Infrastructure	15	3	6	7	9	10	12	13	16	21	18	25	29
Information & communication technologies (ICTs)	41	16	3	18	15	19	5	2	17	21	22	23	27
ICT access	2	15	6	9	30	25	12	9	26	11	5	1	3
ICT use	18	5	6	2	26	17	19	12	4	1	24	8	9

For ICT access and use, we now consider some figures from the ICT Development Index (IDI) 2015, which provides a perspective on ICT access and use not influenced by the two GII indexes related to government services and consultation-related initiatives.

Key case – Paymit:*

Paymit is a mobile payment system that makes it possible for any private individual, using a smartphone, to make cashless payments to another individual, or purchases in shops or restaurants, e-commerce or in-app purchase. The amount of money can be paid, requested, or shared out in real time. Anyone aged 14 or over who has a smartphone and a Swiss mobile number can use it. Thus, companies and customers benefit from a comprehensive payment and customer interaction solution. Payments are QR code-based, with the QR code shown on the terminal, webpage, or in app, scanned by the Paymit QR-code reader and paid by the user by simply swiping the amount in the app in order to confirm. Customers can pay at all Paymit points of sale, regardless of which Paymit app they use. Paymit's strategy focuses not only on widespread availability at merchants, but also on building up a large user base and providing an excellent user experience. The Paymit apps allow real-time bookings to and from bank accounts (the direct booking of credit and prepaid cards is also supported). Paymit meets high security standards, which ensures user data is protected at all times. Currently, Paymit relies on partnerships with banks such as UBS, Zürcher Kantonalbank, Banque Cantonale de Genève (BCGE), Banque Cantonale Vaudoise (BCV), Luzerner Kantonalbank (LUKB), Obwaldner Kantonalbank (OKB), Raiffeisen, Sankt Galler Kantonalbank (SGKB) and Zuger Kantonalbank (ZGKB).

*(Schneider 2016)

Table 4 shows the values for Switzerland, Denmark, Sweden, Norway, Finland, Germany and the UK for the dimensions making up the two indexes. As in the case of the global context, the countries have been selected for their similarity to Switzerland in terms of population (9,631,261 for Sweden, 5,640,184 for Denmark, 5,091,924 for Norway, and for Finland 5,443,497), their ranking first in the pillars shown in

Table 3 (Denmark), and their performance in promoting digital innovation through infrastructure and ICTs even with a higher population (63,489,234 for the UK and 82,652,256 for Germany).

Table 4. IDI Access and Use Sub-Index for Switzerland, Denmark, Sweden, Norway, Finland, Germany and the UK, adapted from International Telecommunication Union (ITU), 2015.

	Switzerland	Denmark	Sweden	Norway	Finland	Germany	UK
IDI Access Sub-Index	6	8.72	8.90	8.24	7.81	9.22	9.24
Fixed-telephone subscriptions per 100 inhabitants	53.62	33.32	39.67	22.72	11.73	56.89	52.35
Mobile-cellular telephone subscriptions per 100 inhabitants	140.54	125.96	127.84	116.51	139.66	120.42	123.58
International internet bandwidth per Internet user (Bit/s)	352,243	341,706	527,447	203,935	218,744	145,990	429,830
Percentage of households with computer	87.56	94.99	93.43	95.40	91.86	90.62	90.84
Percentage of households with Internet access	90.60	93.12	89.57	93.07	89.83	89.47	89.93
IDI Use Sub-Index	8	8.83	8.32	8.43	8.21	6.98	8.42
Percentage of individuals using the Internet	87.00	95.99	92.52	96.30	92.38	86.19	91.61
Fixed (wired)-broadband subscriptions per 100 inhabitants	45.97	41.38	34.19	38.14	32.30	35.78	37.38
Active mobile-broadband subscriptions per 100 inhabitants	76.61	115.77	116.33	93.02	138.47	63.61	98.66

Focusing on the IDI Access Sub-Index, Switzerland demonstrates a weakness with regard to the percentage of households with computers (87.6) relative to the other countries in **Table 4**. Germany

performs better with regard to fixed-telephone subscriptions per 100 inhabitants (56.89), Sweden and the UK with regard to international Internet bandwidth per Internet user (527,447 and 429,830 respectively), Denmark and Norway with regard to the percentage of households with Internet access (93.12 and 93.07 respectively).

Moving to the IDI Use Sub-Index, Denmark is still leading (8.83) even if marginally with regard to Switzerland (8), which is leading in fixed (wired) broadband subscriptions per 100 inhabitants (45.97). Nonetheless, Switzerland again is relatively weaker with regard to active mobile broadband subscriptions per 100 inhabitants (76.61), especially relative to Denmark (115.77) and Sweden (138.47), the former considered among the leaders at the global level in infrastructure for ICTs use and the latter among the top performers in innovation for Europe (together with Switzerland and the UK). However, performance related to mobile-broadband subscriptions in the European context should be framed under the costs and regulation constraints identified above for the global context.

2.3 Fintech infrastructure

“Financial technology,” or *Fintech*, can be defined as *an economic industry composed of companies that use technology to make financial systems more efficient*.¹² In particular, these companies, usually (but not always) startups, propose and develop digital technologies with the purpose of disrupting incumbent financial systems.¹³

PayPal and bitcoin can be considered two examples for digital payments and digital/crypto currencies, while other Fintech-related businesses can refer to crowdfunding, peer-to-peer lending, algorithmic asset management, “robo-advising,” thematic investing, data collection, credit scoring, education lending, exchanges, working capital management, cyber security, and quantum computing.¹⁴ Fintech trends and development specifically rely on infrastructure as a recognized instrumental factor for the competitiveness of a financial center.¹⁵ In particular, the ability to access online services and having an online economy is key to Fintech adoption.¹⁶

As shown in **Table 5**, according to the Global Financial Centers Index (GFCI),¹⁷ Switzerland boasts two cities among the top 20 financial centers, Zurich and Geneva, the former ranked #7 both overall and in the infrastructure index. This is related to the importance of technology and innovation for promoting Switzerland as a center for Fintech and digitalization, and having a high-quality financial market infrastructure.¹⁸

¹² McAuley 2014

¹³ Dietz et al. 2015; McAuley 2014

¹⁴ McAuley 2014

¹⁵ Z/Yen Group 2015

¹⁶ Langley et al. 2014

¹⁷ Z/Yen Group 2015

¹⁸ Swiss Bankers Association 2016

Table 5. Global Financial Centers Index (GFCI) ranking the top 20 centers at the global level and for infrastructure (Investment in infrastructure, ICT speed and reliability), adapted from Z/Yen Group (2015).

Center	GFCI Ranking	Infrastructure Ranking
London	1	1
New York	2	2
Hong Kong	3	3
Singapore	4	4
Tokyo	5	5
Seoul	6	6
Zurich	7	7
Toronto	8	9
San Francisco	9	-
Washington DC	10	-
Chicago	11	10
Boston	12	-
Geneva	13	-
Frankfurt	14	-
Sydney	15	11
Dubai	16	12
Montreal	17	-
Vancouver	18	-
Luxembourg	19	8
Osaka	20	-

London is by far the top performer, also having the UK one of the highest levels of mobile and Internet penetration globally (see

Table 3 and **Table 4**) and a highly competitive financial services infrastructure.¹⁹ Nevertheless, according to the Ernst & Young report on the Fintech landscape in the UK,²⁰ emergent Fintech players such as peer-to-peer networks as well as cryptographic currencies (e.g., bitcoin) have become

¹⁹ Langley et al. 2014

²⁰ Langley et al. 2014

frustrated with existing infrastructures and are in the process of circumventing them, whereas established Fintech players are instead seeking to change legacy infrastructures through infrastructure accelerators. Consequently, diverse strategies have been followed by companies in the UK, either focusing on the maintenance of existing infrastructure, or its replacement with high risk, supposedly producing high returns if successful.²¹ As shown in Table 6 for the UK, the strategic decisions are framed by the market value of Fintech key markets related to a competitive infrastructure, especially platforms and payments systems.

Table 6. Fintech key market, segments, and market value (revenue estimated for the UK), adapted from Langley et al. (2014)

Key market	Segment	Market value (revenue - estimated)
Platforms	Peer 2 Peer (P2P) lending	<£50mn
	Trading platforms	£0.8bn
	Personal wealth	£0.7bn
	Aggregators	£0.5bn
Payments	Infrastructure	£8.1bn
	Online payments and FX	£1.9bn

Regarding Swiss funding activities, Ernst & Young (E&Y)²² points out a potential lack of funding in relevant areas at the infrastructure level such as ICTs. According to E&Y, ICT investments represent 49% or 44 financing rounds in 2014, realizing only CHF 86.3 million of funding (18.3% of approximately US\$ 470 M). Looking at the E&Y Fintech Adoption Index,²³ the results shows that in the US, 16.5% of users use two or more Fintech products, followed by Singapore (14.7%) and the UK (14.3%).

In Switzerland, however, the main startup activity over the past two decades has concentrated on the life sciences segment; however, in recent years, there appears to be momentum building in the ICT sector as well, with companies such as Doodle, Local.ch, and Homegate. Further, the Fintech startup ecosystem may be increasing momentum, promising to place Switzerland on the

²¹ Langley et al. 2014

²² Widmer et al. 2016

²³ The E&Y Fintech Adoption Index is based on a survey of more than 10,000 digitally active consumers based in, among others, Singapore, the United States, and the United Kingdom. The index describes adoption rates of Fintech products, the kind of users adopting them, and the outlook of future usage (Widmer et al. 2016).

map of global Fintech hubs.²⁴ It is worth noting that Switzerland ranks #8 at the global level in the Digital Money Index 2016 by Citi,²⁵ moving up two positions since 2014 and evaluated “Materially Ready.” Taking these issues into account, Table 7 shows a selection of Fintech-related activities carried out in Switzerland since 2013, which represents the tip of the iceberg of the increasing number of associations, incubators, accelerators and projects.

Key case – Digital Currencies in Switzerland: In June 2015, bitcoin became exempt from Switzerland’s Value Added Tax (VAT). Located near Zurich, the small town of Zug is one of the foremost bitcoin industry startup areas in the world (called “Crypto-valley Zug”), having attracted more than 15 digital currency focused companies such as Xapo (which relocated from Silicon Valley to Switzerland), Monetas, Shapeshift, and Ethereum.

In addition, the interest in digital currencies such as bitcoin and the blockchain technology behind it has raised the interest of large Swiss financial players. Since April 2015, UBS has an innovation lab at London’s Canary Wharf Group technology accelerator space, Level 39, focused on new applications for blockchain technology and Smart Contracts, and has announced in September 2015 its “settlement coin” prototype.²⁶

Table 7. Fintech-related activities in Switzerland, adapted from Widmer, Schneider, and Hucker (2016).

Incubators and accelerators	SIX FinTech Incubator F10	Fusion	Nexusquared	BlueLion Incubator	Kickstart Accelerator
Initiatives	Digital Zurich 2025	Impact Hub			
Science	EPFL	IFZ	Swiss FinTech Innovation Lab		
Associations	SwissBanking	Swiss Finance Startups	Swiss Fintech Innovations	Swiss Finance + Technology Association	

UBS, Credit Suisse, Swisscom, Swiss Life, and Ernst & Young are planning to launch a common Fintech accelerator program for early stage Fintech startups. The initiative, part of the Kickstart Accelerator of the Kick Foundation in cooperation with DigitalZurich2025, is supported by the two Swiss Fintech associations, Swiss Finance Startups and the Swiss Finance and Technology Association, and will have the first round in Zurich, from July through September 2016, mainly focused on Wealth Management, Digital Identity, and blockchain, for which Switzerland offers location advantages.²⁷

²⁴ Widmer et al. 2016

²⁵ Davé, Shirvaikar, and Baxter 2016

²⁶ Parker 2016

²⁷ Credit Suisse 2016

2.4 IT/Telco Trend

In the previous sections, we have analyzed the position of Switzerland at the global as well as European level with regard to dimensions related to network infrastructure. Network infrastructure has among its main goals to enable the delivery and use of applications as services, especially in the current market characterized by digital competition. Taking these issues into account, we briefly discuss an emerging trend from the report “The Year Ahead 2016.”²⁸ As pointed out by Bloomberg analysts on the basis of IDC data,²⁹ global IT spending has shown a growth in spending on cloud computing (28.1 % in 2014 to a forecast of 36.7% in 2016) with Public Cloud spending at 24% (forecast 2016) and Private Cloud at 12.7% (forecast 2016). In particular, as pointed out by Forrester research, the availability of public cloud platforms has compelled the networking industry to consider the idea of transitioning the network over to *white-box switches*, with the promise of reducing the network infrastructure costs by 90%.³⁰ The implication of the above represents a challenge for the networking market itself and an opportunity for countries having a top ranked infrastructure.

Key case – Cisco white-box switches: Cisco’s August 2015 earnings report accounted for \$438 million in revenue for white-box switches and open management software (Bloomberg Businessweek 2015). As reported by *Bloomberg Businessweek* (King 2015), according to Chuck Robbins, Chief Executive Officer of Cisco Systems, this market is promising as far as the request for highly customized systems is connected to the fact that most corporate IT departments do not want to build their networking components from scratch. Furthermore, as reported by *Bloomberg Businessweek* (King 2015), IDC analyst Rohit Mehra has pointed out that “80 to 90 percent of enterprises don’t have the skill set, the expertise, and the R&D to do integration, nor do they want to spend their time figuring out all of this.”

White boxes are generic models for digital switches built from off-the-shelf components. In the past, original device manufacturers would produce these switches and then other companies would brand them. More recently, the original device manufacturers have started selling these generic switches directly to users (usually other companies), who can bundle them with third party software.³¹ Companies offering white-box switches like Google and Amazon as well as other as-a-service providers have started to design their own hardware and software.³² While still an emergent market, IDC has estimated annual sales of white-box switches to top \$400 million by the end of 2015.³³

²⁸ Bloomberg Businessweek 2015

²⁹ Bloomberg Businessweek 2015

³⁰ Kindness 2015

³¹ Hollingsworth, T. 2014. “White-box switches: Are you ready?” <http://www.networkcomputing.com/networking/white-box-switches-are-you-ready/1465296666>











³² Bloomberg Businessweek 2015

³³ Bloomberg Businessweek 2015

2.5 Summary

Table 8 provides a summary of the main indicators considered in this Section. With regard to *Infrastructure*, the figures discussed in the previous sections show that at a global level, Switzerland has a *strength* in *ICT access*, particularly with regard to fixed Internet connections, International Internet bandwidth per Internet user (Bit/s), and network support for the Internet of Things (IoT), smart cities, and energy efficiency (players such as, e.g., Swisscom invest nearly 1.7 billions francs for the performance of the infrastructure); whereas *ICT use* presents a *weakness* for Switzerland in terms of mobility and especially mobile broadband, also due to the above-mentioned regulatory constraints.

Table 8. Comparative analysis of Infrastructure and Fintech Infrastructure for Switzerland and top performers at the global level.

Indicator	Switzerland	Singapore	Hong Kong	USA	Luxembourg	The UK
Infrastructure	 Competitive in ICT access and network support for IoTs, smart cities, and energy efficiency.	 Leading in ICT infrastructure, particularly with regard to digital government services	 Leading for Infrastructure, particularly for ICT access and ecological sustainability	 Competitive in ICT infrastructure, particularly with regard to ICT use	 Improving in ICT network infrastructure, yet definitely competitive for ICT access and use	 Leading in infrastructure, particularly for ICT access and ICT use and the performance of areas such as London
Fintech Infrastructure	 Competitive among the Fintech global centers, thanks to funding and supporting infrastructure	 Leading in Fintech infrastructure and adoption rates	 Leading in Fintech infrastructure and adoption rates	 Leading in Fintech infrastructure and adoption rate (having New York among the top three centers at the global level)	 Competitive among the Fintech global centers, thanks to funding and the action of government and public institutions.	 Leading in Fintech infrastructure and adoption rate (having London among the top three centers at the global level)

With regard to Fintech, this sector sees Switzerland as one of the potential key players at the global level, apart from the quality of the infrastructure, also thanks to the presence of global banks and international business players. This is specifically interesting because it represents an evolution toward a digital diversification from its historical brand for banking and finance excellence. Indeed, while startup activity related to the ICT sector (such as, for example, Doodle, House trip, Local.ch, and Homegate) have been successful but conforming to the global template of Silicon Valley (“playing the US game”), Fintech represents an opportunity to pursue a more “Swiss approach” to financial innovation (tailored and related to Swiss strength in financial services), partic-

ularly with regard to blockchain infrastructure governance and its potential application to areas such as smart cities and energy efficiency.

2.5.1 Recommendations

These recommendations are based on research on the secondary data from the sources cited and primary data from interviews with experts. Inasmuch as we believe these innovation and infrastructure indexes to rate and rank important aspects of the digital economy, it seems clear that Switzerland, while in general enjoying good ICT infrastructure, and excellent non-digital infrastructure, is not currently considered to be a global leader in the digital economy. Thus in the coming years, Switzerland may want to consider prioritizing infrastructure investments in:

- *Mobility:* Supporting user needs regarding mobility and service offerings, especially mobile broadband Internet but also wifi hot spots on public transportation and infrastructure supporting general migration of Internet usage toward smartphones and other smart devices.
- *Agility:* Switzerland is leading in ICT infrastructure in terms of stability and reliability, among other performance indicators; in addition, the constant pressure for innovation is leading to a highly competitive financial infrastructure. However, the overall capacity of the digital infrastructure will face in the coming years the challenge of being able to adapt rapidly to changes required by digitalization in terms of agility and flexibility. Even good infrastructures need to evolve.
- *Meeting user needs:* Besides the constant maintenance and evolution of the infrastructure, especially geared toward mobile broadband, specific attention could be placed on expanding digital service offerings capable of fully exploiting the potential of the ICT and fintech infrastructure by considering the overall experience of the customer / user / citizen going beyond purely functional needs. Participatory design and design thinking initiatives are worth considering as a way to effectively target customer experience and needs.

***Branding:* Another course of action could then be oriented toward positioning and branding strategies aimed at promoting the attractiveness of Switzerland's infrastructure for finance-oriented digital services.**

Chapter 3 Data governance

3.1 Definition and scope of data governance

Data governance concerns the orchestration of people, processes, and technology to enable an organization to exploit data as an asset.³⁴ Data governance encompasses data quality, data modeling, data integration, data architecture decision-making and management, as well as data security and privacy issues. In this chapter, we focus specifically on the latter, by investigating current legislation in Switzerland as well as in other countries at the global and European levels. Transparency and trust in data management will also be part of the discussion below.

3.2 Data protection and privacy

Table 9. Privacy and data protection index rankings for Switzerland and selected countries at the global level, adapted from (Sherman et al. 2015). Red and orange are used for countries with no or minimal restrictions; green for countries with restrictions; while blue denotes countries most restricted in terms of privacy and data protection. Shades are used for indicating factors that weaken the association to the level corresponding to the full color.

Index	Switzerland	Singapore	China	Hong Kong	Australia	Japan	Israel	Republic of Korea	USA
Privacy and data protection (Forrester 2015)	Some restriction	Minimal restrictions and potential impact by Government surveillance	Effectively no restrictions and potential impact by Government surveillance	Effectively no restrictions and potential impact by Government surveillance	Some restriction	Minimal restrictions	Most restricted	Restricted	Minimal restrictions and potential impact by Government surveillance

Table 1 and

Table 3 show the classification for privacy and data protection of selected countries based on *Forrester's 2015 Data Privacy Heat Map*.³⁵ This "heat map" highlights the fact that countries (such as Switzerland) with constitutions, or support individuals' right to data privacy generally get high ratings and are more likely to have well-defined legal frameworks in place. It also shows that higher

³⁴ Batini 2010

³⁵ Sherman et al. 2015

privacy and data protection standards require significant effort on behalf of companies in order to ensure the organization’s compliance. Conversely, governments (such as China and to a certain degree the UK and the US) with actual or presumed citizen surveillance receive low ratings. This is also due to the potential negative effects surveillance activities have on commerce.

Table 10. Privacy and data protection index rankings for Switzerland and selected countries at the European level, adapted from (Sherman et al. 2015). Red and orange are used for countries with no, or minimal restrictions; shades of green for countries with restrictions; while blue denotes countries most restricted in terms of privacy and data protection. Shades are used for indicating factors that weaken the association to the level corresponding to the full color.

Index	Switzerland	Norway	The UK	Sweden	Spain	Estonia	France	The Netherlands	Finland	Denmark	Germany	Luxembourg	Iceland
Privacy and data protection	Some re- striction	Re- stri- cted	Some re- stricti- on and poten- tial im- pact by Gov- ern- ment sur- veil- lance	Some re- stricti- on	Re- strict- ed	Most re- strict- ed	Some re- stricti- on	Most re- strict- ed	Most re- strict- ed	Most re- strict- ed	Re- strict- ed	Most re- strict- ed	Re- strict- ed

In the European context, according to DLA Piper (Eecke 2016), EU data protection legislation is facing massive changes. Privacy issues arising from the challenges of digitalization have required the European Union (EU) to entirely rethink its data protection legislation. In 2012, the European Commission (EC) published the General Data Protection Regulation (GDPR) and reached a political agreement in 2015. The final text is expected to be formally adopted by the European Parliament and Council at the beginning of 2016 and will then be enacted over the next two years. The GDPR proposes measures, and failure to comply with one or more of the provisions may lead to fines that can amount to EUR 20 million or 4% of global annual turnover.³⁶

The GDPR adopts a *data protection by design* perspective. In other words, companies must demonstrate that measures are continuously reviewed and updated. This means that new obliga-

³⁶ Bholasing 2016

tions relevant to almost all businesses will be directly enacted in every EU Member State. The GDPR will replace the current EU Data Protection Directive (95/46/EC) that currently governs the processing of personal data and the free movement of such data. This Directive, however, has been implemented differently by EU Member States with a consequent fragmentation of national policies within the EU. However, the Directive does establish a number of key legal principles implemented in each of the 28 European Union Member States through national data protection laws: *Fair and lawful processing, Purpose limitation and specification, Minimal storage term, Transparency, Data quality, Security Special categories of data, and Data minimization*. The effects of these directives may explain the general high level of “restrictions” among the countries in

Table 3. However, the fragmentation of the regulation’s implementation explains why some countries (Estonia, The Netherlands, Finland, Denmark, and Luxembourg) have some of the highest levels of restriction at global level as opposed to all EU countries.

In Switzerland, the processing of personal data is regulated by the Federal Act on Data Protection of 19 June 1992 (FDPA) as well as by the Ordinance to the Federal Act on Data Protection (DPO) and the Ordinance on Data Protection Certification (ODPC). Furthermore, the processing of personal data by the public sector and regulated markets is restricted by additional laws. According to the Swiss legal framework, *personal data* are defined as all information relating to an identified or identifiable natural or legal person.³⁷ The FDPA protects *sensitive personal data*, which includes *personality profiles*³⁸ as well as religious, ideological, political, and trade union related views, health, intimacy, racial origin, social security measures, administrative and criminal proceedings, and sanctions.

The Federal Data Protection and Information Commissioner (FDPIC) is the Swiss authority that supervises federal and private bodies, advises and comments on the legal provisions of data protection, and assists federal and cantonal authorities with data protection. However, the FDPIC does not have specific direct powers to enforce the DPA. It informs the public about its findings and recommendations, and maintains and publishes the register for data files. The processing of personal data by private persons does not usually have to be signaled or registered. However, private persons must register their data files before the data files are opened, if (1) they regularly process sensitive personal data or personality profiles, or (2) they regularly disclose personal data to third parties unless exemptions apply³⁹ such as the data processed by journalists. In this case, the data controller must have designated a data protection officer who independently monitors internal compliance with data protection regulations. Yet there is no general requirement under Swiss data protection law to appoint a data protection officer. The data controller must notify the FDPIC of the appointment of a data protection officer and thereupon the company will be listed on

³⁷ Eecke 2016

³⁸ Collections of data that allow the appraisal of essential characteristics of the personality of an individual (Eecke 2016).

³⁹ Eecke 2016

the public list of companies exempt from the requirement to register their data files.⁴⁰ Taking the above issues into account, the data controller must take adequate technical and organizational measures to protect personal data against unauthorized processing and ensure its confidentiality, availability and integrity, specifically against:

- Unauthorized or accidental destruction;
- Accidental loss;
- Technical errors;
- Forgery, theft or unlawful use; and
- Unauthorized altering, copying, accessing or other unauthorized processing.

Yet, as mentioned by DLA Piper⁴¹ there is no explicit statutory requirement to notify the FDPIC or the affected data subjects of data security breaches under the FDPD. Depending on the scale and severity of a breach, notifying the data subjects may be necessary based on the data controller and processor's obligation to ensure data security. According to Article 4 of the FDPD the following principles apply to Swiss regulations regarding the collection and processing of personal data (including data of legal entities):

- Personal data may only be processed lawfully;
- Its processing must be carried out in good faith and must be proportionate;
- Personal data may only be processed for the purpose indicated at the time of collection, that is evident from the circumstances, or that is provided for by law;
- The collection of personal data and in particular the purpose of its processing must be evident to the data subject;
- If the consent of the data subject is required for the processing of personal data, such consent is valid only if given voluntarily on the provision of adequate information;
- Consent must be given expressly in the case of processing of sensitive personal data or personality profiles.

Regarding data transfer, the FDPIC maintains and publishes a list of countries outside Switzerland offering an adequate level of data protection for personal data disclosure. Most of the EU and European Economic Area countries are included in the list for data on *individuals*; Austria and Liechtenstein are among the few EU countries considered to have an adequate level of data protection for *legal entities*.

Expert insight: Collecting large amounts of data depends in part on users' willingness to let third parties be privy to their data. This requires a certain level of trust in the infrastructure, the companies (and/or government), and policies regulating collection, storage, and use of said data. This is an important challenge for Switzerland (and most countries) now and will be even more so in the future.

⁴⁰ Eecke 2016

⁴¹ Beusch-Liggenstorfer and Schwibs 2016

Data transfer to the USA includes additional compliance requirements (transition period until the end 2016): (1) data subjects must be informed of the transfer of their data and of the possibility that the US authorities may access them; (2) the contractual parties support data subjects to exercise their rights with foreign authorities. It is worth noting that Swiss civil law allows data subjects to apply for injunctive relief and to claim damages, satisfaction and/or surrender of profits based on the infringement of its privacy and the FDPa provides for criminal liability and fines of up to CHF 10,000 if a private person intentionally fails to comply with the obligations under the FDPa. These include the duty to provide information when collecting sensitive data and personality profiles, and the duty to safeguard the data subject's right to information.⁴²

The processing of personal data for online services is subject to the FDPa and to other regulations such as the Swiss Telecommunications Act (TCA). Privacy issues such as the use of cookies are regulated here. Besides the above-mentioned regulations, electronic marketing practices must comply with the Swiss Federal Act against Unfair Competition ("UCA"), which applies to B2B and B2C relationships, and generally requires prior consent by the recipient (*opt-in*). This is different from direct marketing (by telephone) where people have to explicitly express their wish not to receive commercial communication (*opt-out*).

Expert insight: The twin issues of data security and trust arose again and again in our interviews. Many interviewees mentioned that Switzerland could use its reputation for security and privacy in the banking and finance sectors to its advantage. One way of doing this would be to create policies and regulations that set a path for policy makers around the world. Instead of following the leader, Switzerland would be the leader and create the rules of the game.

3.3 Transparency and trust in data management

Privacy and data protection increase transparency and trust in data management by the final users, either citizens or consumers. Given the pervasiveness of digitalization in business as well as nearly all areas of an individual life, it is worth mentioning the results presented by *frog*, a global product strategy and design firm, in a 2015 *Harvard Business Review* article.⁴³ The survey involved 900 people in five countries—the United States, the United Kingdom, Germany, China, and India. According to the results, Indians are the most aware of their data trail and Germans are the least aware. In general, only 25% of people realized that their data included information on their location (even if location and demographic information were the least valued across the countries sample), 14% understood that they were sharing their web-surfing history, while 97% expressed concern that businesses and the government might misuse their data.

The respondents' main concern was identity theft. Privacy issues were ranked highly by 80% of Germans and 72% of Americans, and they said they were reluctant to share information with businesses because of this concern. Overall, government identification, health, and credit card infor-

⁴² Beusch-Liggenstorfer and Schwibs 2016

⁴³ Morey, Forbath, and Allison 2015

mation were the most highly valued data; whereas Germans place the most value on their personal data. Chinese and Indians were positioned at the opposite ends of the spectrum. British and American respondents were in the middle. Table 11 shows that social media companies were the least trusted organizations by respondents to the *frog* survey, while infrastructure players considered in Chapter 2, such as telecom carriers or payment/credit card companies were more trusted by consumers.

Table 11. Data from the 2011-2014 survey from *frog*, a global product strategy and design firm, on consumers' perceptions of the trustworthiness of different categories of companies. The survey asked respondents to rate the institutions/organizations as follows: *completely trustworthy* (respondents would freely share sensitive personal data with a firm because they trust the firm not to misuse it); *trustworthy* (they would "not mind" exchanging sensitive data for a desired service); *untrustworthy* (they would provide sensitive data only if required to do so in exchange for an essential service); and *completely untrustworthy* (they would never share sensitive data with the firm).⁴⁴ The percentages shown below are the percentage of respondents who answered *completely trustworthy* or *trustworthy* to each question.

Primary care doctors	Payment or credit card companies	E-commerce companies	Consumer electronics companies	Insurance companies and banks	Telecom carriers	Technology Companies	Internet corporations (e.g. Google and Yahoo)	Governments	Media and entertainment companies	Social Media Companies
87%	85%	80%	77%	76%	73%	70%	68%	66%	61%	56%

3.4 Infrastructure supporting data & information management

Aside from behaviors related to data and information management, a key role is played by the infrastructure supporting data access and use (see also Chapter 2 above). In particular, the advent and diffusion of cloud computing, which privileges the use of an on demand network of remote servers on the Internet rather than a local server or a personal computer to store, manage, and process data, increased the importance of a country's capacity to host secure Internet servers (servers that use encryption technology in Internet transactions).⁴⁵

Table 12. Secure Internet server availability per million population (2013) rankings for Switzerland and selected countries at the global level for the WEF Global Information Technology Report 2015⁴⁶. Gray-colored cells represent the top ten countries.

Dimension	Switzerland	Singapore	China	Hong Kong	Australia	Japan	Israel	Republic of Korea	USA
Secure Internet servers	3	25	105	22	12	20	32	6	11

⁴⁴ Morey, Forbath, and Allison 2015

⁴⁵ 69% of the respondents to the pwc Global State of Information Security Survey 2016 use cloud-based cybersecurity services to protect sensitive data and ensure privacy, also entrusting critical services to the cloud such as, e.g., real-time monitoring and analytics, advanced authentication, and identity and access management (pwc 2016).

⁴⁶ Adapted from Dutta, Geiger, and Lanvin 2015

The results from the WEF Global Information Technology Report 2015, Table 12 and Table 13 show the ranking of Switzerland for the availability of secure Internet servers at the global and European level, respectively. The Figures confirm Switzerland's leading position. The country is ranked #3 at global level and its main competitors are European (Iceland, ranked #1, The Netherlands, ranked #2, and Luxembourg, ranked #4). Among the factors that contribute to Switzerland's leading position in security of Internet servers is its expertise in the field of cryptography, which is reflected in Swiss companies such as Crypto, Omnisec, Qnective or Adeya, among the leading international players in the information security market.⁴⁷

Table 13. Secure Internet server availability per million population (2013) rankings for Switzerland and selected countries at the European level based on the WEF Global Information Technology Report 2015⁴⁸. Green cells indicate countries ranked #1, while grey-colored cells represent the top ten countries.

Dimension	Switzerland	Norway	The UK	Sweden	Spain	Estonia	France	The Netherlands	Finland	Denmark	Germany	Luxembourg	Iceland
Secure Internet servers	3	7	13	10	33	18	28	2	8	5	16	4	1

The above figures on privacy, data protection, and security point to Switzerland's potential in the data center market. Amazon, Microsoft (\$15 billion), Google, and IBM, as well as startups such as DigitalOcean are spending tens of billions of dollars to construct massive data centers around the world for cloud operations.⁴⁹ Switzerland is well placed to take advantage of this growing trend. Decisions on where to build these data centers are based on infrastructure—so it is important to set up servers near the biggest centers of Internet traffic growth—and compliance issues. It is increasingly necessary to deal with national data-privacy laws and customer preferences, which leads to the need for storing data in a user's home country, or in other cases, avoiding it.⁵⁰ Given this, in Europe, for example, Dublin is attracting firms due to low corporate taxes. IBM and DigitalOcean prefer London, since it is able to accommodate companies in the financial district. Frankfurt is the go-to city for data storage by the most privacy-sensitive companies (Amazon, IBM, and DigitalOcean).

In 2013, the total area of data centers operated by external suppliers in Switzerland was estimated at around 150,000 m².⁵¹ Furthermore, according to a 2012 study from Broadgroup/IWSB, Switzerland was ranked #2 in Europe for density of data centers behind Ireland.⁵² That said, Ireland is less

⁴⁷ S-GE 2015

⁴⁸ Adapted from Dutta, Geiger, and Lanvin 2015

⁴⁹ Bass and Clark 2015; Bloomberg Businessweek 2015

⁵⁰ Bass and Clark 2015

⁵¹ Tedeschi 2015

⁵² S-GE 2015

competitive in terms of risk assessment as shown in Table 14. This table shows rankings based on the Data Centers Risk Index published by Hurleypalmerflatt and Cushman&Wakefield⁵³ for Switzerland and the top ten countries worldwide. This ranking assesses countries according to the risks likely to affect successful data center operations (energy costs and security, corporate taxes, water availability, political stability, natural disasters, and education, among others).

Table 14. Rankings for Switzerland and the top 10 countries at the European and Global level for the Datacenter Risk Index 2013. Green cells indicate countries ranked #1, while gray-colored cells represent the top ten countries.







Index	Switzerland	USA	UK	Sweden	Germany	Canada	Hong Kong	Iceland	Norway	Finland	Qatar
Data Center Risk	11	1	2	3	4	5	6	7	8	9	10

A number of factors make Switzerland competitive in this area. Worth mentioning are the lowest rates of inflation and corporate taxes, energy costs, water availability per capita, political stability as well as the current level of Internet bandwidth per Internet user (Bit/s), as seen in Chapter 2. High labor costs and energy security issues related to potential natural disasters are among the factors that impact Switzerland negatively as a data center location.

3.5 Summary

Table 15 provides a summary of the main indicators discussed above. With regard to *data governance*, the data discussed in the previous sections show that at the global level, Switzerland is strong in *privacy and data protection*, because of its legal framework and constitution but also thanks to its infrastructure, which guarantees highly ranked *server security*. Consequently, Switzerland is well placed to be a very strong player in the data center market and a trusted place to host data.

Table 15. Comparative analysis of data governance for Switzerland and top performers at the global level.

Indicator	Switzerland	Germany	Netherlands	USA	Luxembourg	UK
<i>Data governance</i>	 Competitive for privacy, data protection, and security of servers	 Improving in the data center market, less strong in security and privacy	 Competitive for privacy, data protection, and security of servers	 Improving in privacy and data protection, yet a global leader in the data center market	 Competitive for privacy, data protection, and security of servers	 Competitive in the data centers market, yet not as strong in privacy and data protection

⁵³ Adapted from Whatling 2013

Thanks to the recently adopted federal strategy, aptly named “Digital Switzerland,”⁵⁴ the country is poised to become a leader in this sector, especially given its competitive position with regard to data governance. The “Digital Switzerland” strategy includes, among its key objectives, “transparency and security” and aims at establishing “*Switzerland as a safe international location for data storage and as an ICT hub with a data policy which takes into account the interests and values of Switzerland in the digital field and anchors it in a regional and international context.*”⁵⁵ The strategic action plan for the “Data and digital content” sector aims to create a national data infrastructure with improved access to digital content and guaranteed control of their own data for Swiss citizens.

3.5.1 Recommendations

These recommendations are based on analysis of the secondary data from the sources cited and primary data from interviews with experts. According to the data governance index as well as other sources discussed in this Chapter, it is clear that Switzerland has the potential to move from being a competitive country to actually being recognized as a global leader for the management of data, a key strategic asset for any digital economy. Thus in the coming years, Switzerland may want to consider prioritizing data governance investments in:

- *Effectiveness of the national data infrastructure:* creating synergies among the public and private sectors for what the Swiss digital strategy calls a national data infrastructure. To achieve this, data orientation and management skills must permeate all sectors, for example public administration, research institutions, and business. Focus should be placed on identifying business models for sustainable exploitation (in terms of privacy and security) of the data available—preferably in open format (see Chapter 5 in this report)—from national data infrastructure, thus providing shared value to businesses and society.
- *Meeting user needs:* initiatives should be carried out both at the policy and business levels in order to understand the preferences, protocols, and behaviors considered appropriate by individuals for the management of their own data. Participatory design and design thinking initiatives are worth considering as a way to effectively target these needs.
- *Branding:* Another course of action could be oriented toward positioning and branding strategies aimed at promoting the attractiveness of Switzerland as the global secure trusted “shelter” for corporate and individual data.

⁵⁴ Schweizerische Eidgenossenschaft 2016

⁵⁵ Schweizerische Eidgenossenschaft 2016

Chapter 4 Startup Business Context / Ecosystem

The business context relates to the overall imperative for increased digitalization, since there is no business sector that has not been touched by the digital revolution. ICT and high technology applications have been integrated into everything from farming, transportation, higher education, and entertainment. A clear understanding of the current new business context should make the next steps to be taken more evident.

4.1 Startups

The differences between a traditional, small business (drycleaner, garage, news stand, cafe...) and a (growth-oriented) startup are important to highlight. Startups enable inventions and scientific knowledge to be applied, transformed and/or translated into technology that can then be turned into a viable product. Commonly occurring characteristics associated with startups are: scalability, growth, failure as a learning mechanism, product and business model innovation, and “non-traditional” company culture. Not all of these characteristics need to occur for a company to be considered a startup. Furthermore, a startup does not have to be technology-oriented, as long as some of the main characteristics are present. Unlike a traditional, small business, a startup does not aim to remain small. It also typically does not enter a mature market, such as a restaurant or plumbing business, hence the need for innovative thinking and learning from failure. Generally speaking, a startup is innovative in at least one of three areas: process (internal change), product / service (external change), or market (new and emerging).

Startups have a higher failure rate compared to traditional businesses, but the potential for growth is greater. A startup can be understood as an experiment; therefore failure is actually an important part of the startup ethos. The policies regulating how business is done and the financing instruments available need to be adapted to the startup business context if increasing the number of successful startups is one of Switzerland’s goals. Switzerland has a tradition of small, family-owned business, but the institutions in place to manage the different aspects of the current business context do not necessarily apply to the startup context. In fact, in some instances, they hinder the development of innovative businesses. Switzerland may have the most competitive economy in the world according to the 2015 Global Innovation Index; however, not a single Swiss city appears on “The Global Startup Ecosystem Report 2015.” Further proof that there may be room for improvement in Switzerland’s startup ecosystem: only eight Swiss companies appear on *Inc. Magazine’s* “5000 Europe,” a list of Europe’s fastest growing privately held companies. Swe-

den and the UK lead the list with over 500 companies each and France comes in third with over 400. And while tech-oriented companies may be important across Europe, among the biggest sectors in Switzerland are actually manufacturing, construction, and retail, sectors not traditionally associated with startups.

4.2 The Global Context

According to several indexes, including the “Global Competitiveness Report” and the GII 2015, Switzerland has the most competitive economy in the world (See Chapter 2 and Table 16. Composite of Global innovation index 2015 below). Not surprisingly, Switzerland ranks high on the political stability index as well. The Swiss economy is also stable relative to other European countries and the United States, and it did not suffer the consequences of the global economic crisis in 2008 to as great an extent. However, an important question to ask is to what extent Switzerland is able to commercialize the innovations that are developed within its borders.

When one examines specific indicators, entrepreneurship in Switzerland has an interesting story to tell. As in many innovation-driven economies, the Swiss entrepreneur is not founding his or her own company out of necessity. Switzerland has a low unemployment rate, which means that well-educated, highly skilled young (18-24 years old) people are able to find jobs and therefore, entrepreneurship is not necessarily a high priority. In fact, employment opportunities and policies regulating small business creation may hinder highly qualified individuals from setting up a business.⁵⁶ Among older (30-54 years old) adults—a population that has had the opportunity to pursue a career already and most likely has achieved some economic stability—entrepreneurship is highest. According to Hsu, Roberts and Eesley (2007) “A number of studies has suggested that age may play a role in the decision to start a new venture..., with an “aging out” phenomenon affecting those in their upper 40s and later years...” (p.770). The situation in Switzerland, however, appears to be different. According to the Swiss Startup Monitor, startups are not necessarily a young person’s game. In 2014, the average age of startup founders was actually 39.9 years old.⁵⁷

Table 16 below is a composite of a number of Global Innovation Index indicators and provides a comparative analysis of innovation indicators in 12 countries.

Table 16. Composite of Global innovation index 2015 indicators

Country	Switzerland	Denmark	Sweden	Germany	Estonia	UK	Israel	Finland	Korea	Singapore	China	US
<i>Global Innovation Index (GI)</i>	1	6	2	7	10	2	9	4	8	5	11	3

⁵⁶ Eberhart, Eesley, and Eisenhardt 2012

⁵⁷ Swiss Start-Up Monitor, 2014

high tech medium tech outputs	2	5	11	3	10	8	12	9	4	1	7	6
knowledge creation	2	9	2	4	10	6	8	7	1	11	5	3
university industry linkages (GII 2014)	1	8	7	6	11	4	5	2	9	3	10	2
graduates in science & engineering	8	7	4	3	5	6	n/a	2	1	n/a	n/a	9
ease of protecting investors	11	4	7	8	9	2	3	10	5	1	12	6
ease of getting credit	10	4	11	5	6	2	8	9	7	3	12	1
business sophistication	2	8	4	9	12	7	6	3	10	1	11	5

According to the 2015 GII, Switzerland is ranked #2 in the high-tech and medium-tech outputs index and tied for second in the knowledge creation index (the US is #3, South Korea is #1). Switzerland's strengths in this regard lie in pharmaceuticals, Medtech, and Cleantech.⁵⁸ In terms of innovation linkages, Switzerland is also well ranked. It is #1 in the 2014 GII university/industry research collaboration, in front of Finland, the US, Singapore and the UK.

Key case - Flisom (long idea-to-market cycle):*†

Flisom is a Swiss solar company that builds flexible photovoltaic panels, a cutting edge technology in the solar panel field. The company has won awards for their product and beaten world records for energy conservation. Flisom was founded in 2005 as a spin-off from the Laboratory of Solid State Physics at the Swiss Federal Institute of Technology Zurich (ETH). EMPA (materials science institute affiliated with the ETH Domain) housed Flisom on its campus until 2013, when the company received additional funding from its partner Tata Group and was able to purchase space for a factory. Since then, Flisom has received additional funding from Tata Group and has consequently been able to scale up quickly from 15 to 55 employees in 1.5 years.* However, the incubation period was eight years, during which time many aspects of the environment were changing. This case illustrates the strong university/industry connections within Switzerland, the focus on deep technology commercialization, and the slow and steady technical progress leading to a successful startup, but also highlights the potential risks of long idea-to-market cycles.†

*(Hagmann, 2015)

†(Scarboro 2015)

In terms of market sophistication sub-indexes that measure ease of protecting investors and ease of getting credit, Switzerland lags behind almost all of the countries in the composite table. (Market sophistication measures credit, investment, trade and competition.) With regard to research

⁵⁸ Scarboro 2015

and development, Switzerland is ranked #7, right in front of the US and below Israel, the Republic of Korea, Denmark, Sweden, Finland, and Japan.⁵⁹ Despite Switzerland being strong in innovation, it appears that translating inventions from the lab to market may be an area where there is room for growth. It would seem that regulations and state policies could be modified to increase Switzerland's market sophistication.

Expert insight - changes in taxation and financing/investment procedures:

Switzerland has expertise in many areas, but information technology is not historically one of these domain areas. One way to encourage more tech-oriented startups is to modify current taxation policies and increase investment opportunities. Currently, experts interviewed by our team feel there is not enough deal flow to justify massive investments in the tech space. Furthermore, they feel there are not sufficient numbers of venture capitalists in Switzerland to adequately support startups. There is plenty of money available, but people are not investing it in startups for a number of reasons, such as potential investors not knowing how to find startups that need investment. Additionally, wealthy Swiss individuals have not historically made their money by founding a startup. One way of solving this problem would be to create specialized startup investment funds managed by banks as a complement to current funding options.

Our experts also mentioned that the current wealth taxation policy in most cantons is a major barrier to startups. At the moment, startups are taxed based on their external valuation (i.e., founders' current tax liability goes up with each investment round). The recent change in policy in the canton of Zurich may be a step in the right direction. Examining the UK's new tax policies more closely might also provide inspiration.

One last point was also raised by our experts: The administrative procedures required to found a company are felt to be too complicated and therefore can discourage founding a company. In the UK, apparently one can found a company in just three hours. And, in the fintech area, new UK companies are even able to receive free legal advice.

Based on the 2015 GII, Switzerland's strengths are the following:

- Business sophistication⁶⁰ (3rd) and a knowledge-intensive work force (3rd).
- Knowledge and technology outputs (1st) and resident patents (1st)
- Knowledge diffusion (1st)
- High tech and medium tech manufactures (1st)
- Political stability (2nd)

Key case - EPFL's Innovation Square (research-business linkage): Founded in 1991, the EPFL Innovation Square (aka the innovation park or scientific park) is located on the south side of the university campus and currently hosts 160 companies. "The EPFL Innovation Park hosts technology driven companies in an inspiring environment, with access to cutting-edge research, a large network of dynamic entrepreneurs and established companies" (Anon n.d.). The innovation park offers coaching to companies—helping entrepreneurs manage their companies, meet the right researchers, and find funding. There are also different types of work environments available to companies, such as co-working spaces, modular workspaces, and office spaces with common areas for all companies (kitchens, meeting rooms). Conditions of acceptance: "Entrepreneurs, start-ups, SMEs or large corporations may become part of the EPFL Innovation Park if they are in collaboration with or intend to collaborate with EPFL, or a Swiss graduate school such as a university, a medical school, an engineering school (Anon n.d.)."

Based on the same index, Switzerland's weaknesses are the following:

- Graduates in science and engineering
- Ease of getting credit
- Ease of protecting investors

⁵⁹ GII 2015

⁶⁰ Business sophistication measures innovation linkages, such as relationships between universities and businesses, knowledge absorption and knowledge-intensive work force.

These last two are included in the market sophistication measurement. While Switzerland does not rank high in graduates in science and engineering, it is unclear, based on the index, whether or not population size and Switzerland's education system (universities of applied sciences and apprenticeships) is taken into account. Furthermore, while the number of Swiss pursuing degrees in science and engineering may be seemingly low, the innovativeness of the country, the high number of individuals working in the knowledge economy and the number of patents would seem to indicate that the data collected in the GII is not telling the whole story. Additionally, enrollment in tertiary education overall has grown consistently in Switzerland from 2005 to 2013, from 46.7% to 56.3%. It is important to keep in mind that engineers and scientists are not the only ones capable of creating an innovative company.

The Global Entrepreneurship Monitor (GEM) dataset provides additional information that changes the overall perspective of Switzerland's strengths and weaknesses in terms of their capacity for entrepreneurship and startup incubation.

The table below is a composite of some of the key indicators from the 2015 GEM dataset. It provides a comparative analysis of entrepreneurial activity in 10 countries.

Table 17. Composite of GEM 2015 indicators for 10 countries

Country	Switzerland	Denmark	Sweden	Germany	Estonia	UK	Finland	Singapore	China	USA
Early stage entrepreneurial activity	6	9	7	10	5	4	8	3	1	2
New business ownership	5	7	10	9	6	3	8	2	1	4
International orientation of businesses	2	8	3	5	4	6	9	1	10	7
Fear of failure	10	2	8	3	1	6	7	5	4	9

Switzerland ranks #6 in total early stage entrepreneurial activity, and is the second lowest among the 18-24 age group. As stated earlier, entrepreneurs in Switzerland tend to be older. Switzerland is also very low in the rankings for necessity-driven entrepreneurial activity. Consequently, Swit-

Switzerland is ranked #5 in new business ownership. According to startup ticker, 80% of Swiss entrepreneurs founded their businesses between the ages of 30 and 49.⁶¹

Expert insight: startup structure: Incubators, innovation parks, and startup hubs seek to increase the probability that young, innovative, creative companies succeed. Some of the experts interviewed provided suggestions regarding what these spaces should look like. Switzerland should look to what works elsewhere as inspiration, not as something to copy. Startup spaces should allow for experimentation and provide a safe environment for failure. Close attention should be paid to how the space flows. Incubators and the like are melting pots, places where people should be able to cross paths easily and learn from one another. Attention should be paid to how people move within the space; co-working spaces should be encouraged. Serendipitous encounters are crucial. They help you advance and challenge you. Startup spaces should also be in attractive locations and easy to get to.

Based on both the GEM and GII data, Switzerland cannot be considered to be a leader in entrepreneurship. That said, there are two very positive points related to new business development in Switzerland, ones that could be exploited to make the country more attractive to startup-type businesses.

Switzerland is ranked #2 in international orientation for early stage entrepreneurial activity after Singapore. Both countries are small and have a limited internal market; therefore an international orientation is an important aspect of doing business in these countries. If scalability, growth and business model innovation are characteristics of startups, then the strong international orientation of new businesses in Switzerland is a great plus. Switzerland may be too small to support strong startup ecosystems oriented toward the domestic market, but by looking beyond its borders, Swiss companies could exploit the country's perceived and actual strengths (precision, high quality products, strong research-business linkages, skilled labor force...) to found internationally renowned companies and attract employees in the long run.

Most surprising is Switzerland's ranking in terms of fear of failure. Despite common belief, Switzerland has a very low fear of failure, lower even than the United States and much lower than any of the other countries we have compared Switzerland to. In fact, since 2003, Switzerland's fear of failure has decreased from 35% to 29%. Fear of failure is included in the GEM survey's perception section and measures whether or not fear of failure would prevent someone from starting a business.

Fear of failure does not necessarily mean high risk aversion. Individuals later in life, with more experience, more knowledge and skills and deeper networks may feel more confident about founding a small business or startup. However, the idea-to-market cycle may be long (years, or even decades) and the final product will probably be of very high quality, reflecting years of research and development.⁶² Thus risk aversion is not the hallmark of the Swiss startup. This "below the radar" type company has a certain "Swissness" about it, especially compared to countries like the United States.

⁶¹ Swiss Start-Up Monitor 2014

⁶² Scarborough 2015

The fear of failure rate also varies along linguistic lines. In the German speaking cantons, fear of failure is much lower than in the French and Italian speaking regions. Not surprisingly, the perceived social capital associated with being a successful business owner is much higher in Italian and French regions. Understanding the roots of this disparity would be helpful if Switzerland's startup ecosystem were to be reinforced.









According to the Global Startup Ecosystem Report 2015, we are living through a major economic transition. "Humanity doesn't see transitions between major economic eras very often, but when they come, every aspect of society gets reinvented: government, business, finance, education, medicine, energy, technology, art, and science all get upgraded." Given that Switzerland weathered the 2008 economic crisis well, has a stable political system, low unemployment and a strong R&D culture around cutting edge technology, the country could very well become a leader in the startup world with some changes to its current system.

4.3 Summary

The table below is a composite of the various indicators considered in this chapter and provides a summary of the overall business context in Switzerland. Switzerland is consistently ranked among the most competitive economies in the world and the most innovative. The country has a highly skilled workforce and enrollment in tertiary education continues to grow. Swiss companies look beyond the country's borders for new markets. Surprisingly, Switzerland ranks even lower than the US in fear of failure being a barrier to starting a new business.

There is still room for improvement in terms of startup ecosystems, however. Namely, changes in funding and taxing startups would help to make the country more attractive to creative, tech-oriented companies. No Swiss city is listed in the international rankings of startup ecosystems and only eight Swiss companies made it onto the list of the top 5000 European new businesses. Switzerland, however, has all the ingredients for becoming a leader in the startup arena.

Table 18. Comparative analysis of the business context for Switzerland and top performers at the global level

Indicator	Switzerland	Singapore	USA	UK
Innovativeness	 Leading in innovativeness; number of patents and knowledge diffusion.	 Competitive in innovativeness	 Leading in innovativeness; strong startup culture	 Leading in innovativeness; strong fintech startup ecosystem
Market sophistication	 Improving with regard to taxation regulations for startups and increasing investment opportunities	 Leading especially in ease of protecting investors	 Leading in ease of starting a business, tax regulations and funding instruments (number of VCs, for example).	 Leading especially in fintech with new tax schemes for startups and investors and new measures for reducing administrative procedures for starting a business.

4.4 Recommendations

- Work with Cantons to help them understand that current taxation policies, in which startups are taxed based on their external valuation, are potentially detrimental to the Swiss startup ecosystem. Currently, when external investors make an investment that increases the value of the company, the founders often incur a large tax bill that cannot be deferred. Thus the most successful companies (the ones whose valuations are growing the most quickly) have incentives to set up operations outside Switzerland while they are raising funds.
- Introduce funding mechanisms that fill the gap between seed money and large investments. Given the long idea-to-market cycle, this is especially important in Switzerland. Due to lack of investment at this level, many growing startups that are a year from entering the market are leaving Switzerland.
 - Major Swiss corporations could position themselves as venture capitalists and close this gap as a peer-to-peer financing mechanism.
 - Another way of reducing this funding gap, could be to create investment funds managed by banks or other bodies that would invest in these companies, so that the investor would not have to seek out companies in need.
 - The “Manifest in favor of Swiss Startups”, available on lereseau.ch lists ten ways of resolving a number of the financing barriers and other barriers such as strict immigration laws, as well as involving the Swiss army as an innovation driver by creating a “Swiss DARPA.” “The Swiss army could put in place an R&D funding agency likely to invest (...) in long term, strategic projects capable of generating disruptive technologies” (Manifest in Favor of Swiss Start-Ups).
- Consciously continue building a vibrant start-up ecosystem. Close attention should be paid to the architecture of the startup incubators and accelerators, as well as to location (urban centers are generally more appealing than more isolated locations). A review of the current incubators, innovation centers, accelerators, tech hubs, and so on (architecture, location, who is in residence and for how long, residents’ feedback on the experience, characteristics of Swiss startup company culture...) would be helpful for further development of the Swiss startup ecosystem. The ecosystem within which a startup is launched and evolves is closely related to its success or failure.
- Areas where Switzerland could leverage its strengths to build strong startup ecosystems: Fintech, biotech, edtech, medtech, cleantech, and data security.
- More emphasis could be placed on ICT and consumer based products.⁶³
- Seek a deeper understanding of the drivers of founding startups: age factors, creativity and innovation, and social capital associated with running/being part of a successful business.

⁶³ Scarboro, 2015

Chapter 5 Public sector

According to the World Economic Forum (WEF), Swiss respondents to the Executive Opinion Survey consider the most problematic factors for doing business the *inefficient government bureaucracy* (15.8), *restrictive labor regulations* (14.4), and *complexity of tax regulations* (11.6). However, looking at Table 19 and Table 20, Switzerland is Ranked #7 at the global level, while at the European level only Luxembourg (ranked #6 at the global level), Norway (ranked #5 at the global level), and Finland (ranked #1 at the global level) perform better and are among the top 10 countries.

Table 19. Ranking for WEF 1st pillar and selected dimensions for Switzerland and selected countries at the global level. Adapted from Schwab (2015). Green cells indicate countries ranked 1st, while gray-colored cells point out top ten countries per index. For dimensions having a negative name but a positive interpretation for top rank positions, shades of red are used for colored cells.

1st pillar index and selected dimensions	Switzerland	Singapore	China	Australia	Japan	Republic of Korea	Israel	USA
Institutions	7	2	51	19	13	69	41	28
Property rights	2	4	51	16	7	45	36	22
Intellectual property protection	3	4	63	13	6	52	29	15
Diversion of public funds	11	4	50	16	14	66	42	28
Irregular payments and bribes	11	3	67	16	12	46	35	32
Judicial independence	6	23	67	13	12	69	18	28
Favoritism in decisions of government officials	13	2	29	27	7	80	81	44
Wastefulness of government spending	11	3	24	53	22	70	79	75
Burden of government regulation⁶⁴	8	1	26	80	54	97	98	51

⁶⁴ This dimension corresponds to the question from the WEF Executive Opinion Survey: "In your country, how burdensome is it for companies to comply with public administration's requirements (e.g., permits, regulations, reporting)? [1 = extremely burdensome; 7 = not burdensome at all]" and 2014–15 weighted average, see Schwab (2015). The dimension is related to administrative efficiency in terms of lack of unnecessary red tape in

<i>Efficiency of legal framework in settling disputes</i> ⁶⁵	8	1	50	22	13	57	44	25
<i>Efficiency of legal framework in challenging regulations</i> ⁶⁶	3	10	66	23	24	74	34	19
<i>Transparency of government policymaking</i>	6	1	36	24	12	123	60	22

Nevertheless, Switzerland has high values (ranking among the top 10 countries at global level) for key indicators for business such as *property rights* (ranked #2), *intellectual property protection* (ranked #3), judicial independence (ranked #6), *efficiency of legal framework* in settling disputes (ranked #8) and challenging regulations (ranked #3), and the *transparency of government policymaking* (ranked #6).

Let us begin by comparing Switzerland to other countries in the top 10 for the “institutions” pillar. For the “negative” (reverse-scored) questions, Switzerland does well, perhaps only (lack of) *burden of government regulation* where it does not score in the top (ranked #8). The number 2 at global level, Singapore, besides being #1 in (lack of) *burden of government regulation*, excels in (lack of) *diversion of public funds* (ranked #4), (lack of) *irregular payments and bribes* (ranked #3), (lack of) *favoritism in decisions of government officials* (ranked #2), and (lack of) *wastefulness of government spending* (ranked #3). It is worth noting that these dimensions should be compared with the fact that Singapore is also ranked #1 at the global level for *regulatory environment* and *regulatory quality*,⁶⁷ while Switzerland is ranked #11 and #13 respectively.

Table 20. Ranking for WEF 1st pillar and selected dimensions for Switzerland and selected countries at European level, Adapted from Schwab (2015). Green cells indicate countries ranked 1st, while grey-colored cells point out top ten countries per index. For dimensions having a negative name but a positive interpretation for top rank positions, shades of red are used for colored cells.

1st pillar index and selected dimensions	Switzerland	Norway	The UK	Sweden	Spain	Estonia	France	The Netherlands	Finland	Denmark	Germany	Luxembourg	Iceland
<i>Institutions</i>	7	5	14	11	65	25	29	10	1	15	20	6	18
<i>Property rights</i>	2	12	3	14	60	27	21	10	1	18	17	5	23
<i>Intellectual property protection</i>	3	17	7	16	62	26	14	8	1	21	20	2	25
<i>Diversion of</i>	11	6	15	13	98	26	27	12	2	7	22	3	20

processes such as the collection of taxes, compliance with regulations, obtaining permits, and the judicial system. According to Schwab (2015:46), there is empirical evidence that burdensome bureaucracy decreases investments and firm efficiency.

⁶⁵ This dimension corresponds to the question from the WEF Executive Opinion Survey: “In your country, how efficient are the legal and judicial systems for companies in settling disputes? [1 = extremely inefficient; 7 = extremely efficient],” with 2014–15 weighted average: see Schwab (2015).

⁶⁶ This dimension corresponds to the question from the WEF Executive Opinion Survey: “In your country, to what extent can individuals, institutions (civil society), and businesses obtain justice through the judicial system against arbitrary government decisions? [1 = not at all; 7 = to a great extent]” with 2014–15 weighted average: see Schwab (2015).

⁶⁷ This dimension considers perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private-sector development (GII 2015).

<i>public funds</i>													
<i>Irregular payments and bribes</i>	11	4	15	18	45	17	30	14	1	6	27	8	5
<i>Judicial independence</i>	6	3	10	14	84	21	29	7	2	5	17	9	19
<i>Favoritism in decisions of government officials</i>	13	6	18	9	78	23	30	8	4	14	17	12	31
<i>Wastefulness of government spending</i>	11	13	34	10	111	19	74	18	9	37	20	16	36
<i>Burden of government regulation</i>	8	19	33	21	124	23	115	30	15	82	34	12	18
<i>Efficiency of legal framework in settling disputes</i>	8	7	6	11	88	25	28	10	3	19	16	9	20
<i>Efficiency of legal framework in challenging regulations</i>	3	7	9	12	65	23	27	6	1	37	11	8	13
<i>Transparency of government policymaking</i>	6	7	13	14	76	23	44	10	5	29	19	4	20

Looking within Europe, Finland, Luxembourg, and Norway are highly ranked for (*lack of*) *diversion of public funds* (ranked #2, #3, and #6 respectively), (*lack of*) *irregular payments and bribes* (ranked 1st, 8th, and 4th respectively), with Finland having high values also for (*lack of*) *favoritism in decisions of government officials* (ranked #4), and (*lack of*) *wastefulness of government spending* (ranked #9). It is worth noting that Finland is ranked #1 at the global level for government effectiveness,⁶⁸ while Switzerland ranks #6.⁶⁹

Thus, Switzerland may be considered a very good performer, if not a benchmark for its ability to balance excellence with an overall coherence and reliability in terms of transparency and reliability of institutions. Switzerland can be considered a “safe harbor” in the current digital society and market, especially at the institutional level with regard to property rights (*Property rights, Intellectual property protection* dimensions) and institutional strength, but also for general excellence in political stability (ranked #2 at the global level by GII 2015). Yet the burden of perceived government regulation and perceived favoritism still represent a negative factor for executives, and an improvement in these areas would have a positive impact on overall public sector performance.

⁶⁸ This dimension considers perceptions of the quality of public and civil services and the degree of their independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government’s commitment to such policies (GII 2015).

⁶⁹ GII 2015

Over the last two decades, the digitalization of government services and the use of platforms for increasing the participation of constituencies of public administration activities have represented a way to improve public sector performance.

Thus, in the next sections we discuss the position of Switzerland with regard to government online services and e-participation, which represent digital governance challenges for improving public sector performance.

5.1 Digital governance

Digital governance in the public sector encompasses the reintegration of administrative and social issues back under government control, while reorganizing government initiatives and activities around distinct constituency groups along the digitalization of administrative services and processes as well as public data.⁷⁰ Thus, in what follows, we will consider how Switzerland performs at the global level considering the *government online service*⁷¹ and *e-participation*⁷² indexes from GII 2015.

Table 21. Government online service and Online e-participation for Switzerland and selected countries at the global level. Adapted from Dutta et al. (2015). Green cells indicate countries ranked #1 by the GII, while grey-colored cells represent top ten countries per index.

Index	Switzerland	Singapore	China	Australia	Japan	Republic of Korea	Israel	USA
<i>Government online service</i>	64	2	47	8	4	3	13	4
<i>Online e-participation</i>	87	10	33	7	4	1	12	9

According to Table 21, Singapore is still among the top 10 performers at the global level in government online services (ranked #2) and e-participation (ranked #10), with Switzerland lagging behind in a dramatic fashion (ranked #64 and #87 respectively); worse, Switzerland's ranking has dropped nearly 50% since 2014 (ranked #32 and #45 respectively).

⁷⁰ Dunleavy et al. 2006

⁷¹ The index considers a country's national websites at the national and local level, as well as e-service portals, and e-participation portals, on the basis of the stages of government online service development, with points assigned for (1) an emerging presence, providing limited and basic information; (2) an enhanced presence, providing greater public policy and governance sources of information, such as policies, laws and regulation, downloadable databases, etc.; (3) a transactional presence, allowing two-way interactions between government and citizens (G2C and C2G), including paying taxes and applying for ID cards, birth certificates, passports, license renewals, etc.; and (4) a connected presence, characterized by G2G, G2C, and C2G interactions; participatory deliberative policy- and decision-making (GII 2015).

⁷² According to GII (2015), the index is based on the survey used for the UN Online Service Index, extended with questions focusing on the use of the Internet to facilitate the provision of information by governments to citizens ("e-information sharing"), interaction with stakeholders ("e-consultation"), and engagement in decision-making processes ("e-decision making").

Table 22. Government online service and Online e-participation for Switzerland and selected countries at the European level. Adapted from Dutta et al. (2015). Green cells indicate countries ranked 1 by the GI, while grey-colored cells point out top ten countries per index.

Index	Switzerland	Norway	The UK	Sweden	Spain	Estonia	France	The Netherlands	Finland	Denmark	Germany	Luxembourg	Iceland
<i>Government online service</i>	64	21	11	28	4	18	1	8	18	35	34	42	43
<i>Online e-participation</i>	87	30	4	45	19	22	4	1	24	54	24	54	64

Furthermore, the figures are confirmed at the European level as well, where France and the Netherlands are ranked #1 respectively for *government online service* and *e-participation* while Spain is among the top 10 countries for the former and the UK for the latter. The Swiss eGovernment strategic plan 2016,⁷³ which has not come into force yet, may fill this gap with regard to other global and European players, but the scheduled operational objectives occur 2016 – 2019:⁷⁴

1. The uniform registration procedure for e-government services on portals at various federal levels by 2019;
2. The ten most frequently requested electronic government services for the general public and businesses will be integrated in the national e-government portals by the end of 2019;
3. The most important e-government standards will be identified on an ongoing basis and developed or updated;
4. A joint organization will be established by 2018 for the procurement, operation and maintenance of joint e-government solutions;
5. An electronic identity (eID) that is valid nationally and internationally by 2019;
6. The areas of application for the electronic signature will be identified by 2017;
7. The allocation of data to a specific person in the electronic exchange between information systems will be ensured by 2019;
8. It will be possible to seamlessly report changes of address (arrival and departure) electronically throughout Switzerland by 2019;
9. The Confederation and the cantons will continually push ahead with extending electronic voting to more voters with the aim of seeing two thirds of the cantons use electronic voting by 2019; and
10. Seamless electronic reporting of VAT will be possible by 2019.

The above initiatives will also contribute to reduce the burden of government regulation, increase government effectiveness, as well as contributing to the effectiveness of infrastructure for busi-

⁷³ Swiss Confederation 2016

⁷⁴ Le Temps 2015

ness development, in particular for issues such as, e.g., identity, residency, and VAT return.⁷⁵

Key case – Terravis: Terravis (<http://www.terravis.ch/>) is a platform that allows electronic transactions between institutional organizations (banks, insurance companies, etc.), notaries, and authorities (Land Registry Offices and Trade). The platform allows trading in mortgages, real estate, and access to data from the commercial register via a single interface. Powered by SIX Securities Services (SIX-SIS), the platform benefits from secure and standardized communication. Currently, the platform exploits the SuisseID standard for remotely signing documents, eliminating the management of USB and smartcards. Terravis thus contributes to reducing the administrative work in public administration, while giving a boost to the process and reducing sources of error. In addition, SIX-SIS offers credit institutions a fiduciary management register of mortgage notes ("Nominee" services). SIX-SIS manages for each participant "Nominee" a deposit to register mortgage certificates and uses the electronic transaction system (Terravis) as a communication channel. Terravis' electronic transaction system is part of efforts by the federal government, cantons, and municipalities to build eGovernment. Terravis is subject to the supervision of the cantons (information portal), the Federal Office of Justice (Electronic Business) and FINMA (Nominee). Terravis is currently in service in cantons such as Aargau, Basel Landschaft, Bern, Glarus, Graubünden, Schwyz, Solothurn, St Gallen, Thurgau, Ticino, Uri and Valais.

Source: <http://www.terravis.ch/>

So far, eGovernment service infrastructure seems more a priority for Switzerland than e-Participation, considering the traditional participatory attitude of the Swiss government and citizens (in terms of public consultations, polls, referenda, etc.), which makes digital participation a channel option or a means rather than a necessary and sufficient condition or an end for citizens' participation in public sector issues.

Key case- GovFaces: GovFaces is an online platform for easy and direct interaction between citizens and politicians. The former start-up project has been incorporated as a SA headquartered in Plan-les-Ouates, near Geneva, and the platform includes journalists, organizations, and academics. GovFaces was first launched as a European Union platform to coincide with the 2014 E.U. elections. Then the platform was opened on March 3rd 2015 to the community in the Portsmouth North and Portsmouth South constituencies. The website accomplishes this goal through an innovative design that allows the community to ask questions, make proposals, and share ideas; then, users can decide which items should get a response first from politicians. The vision of the platform is global, aiming to allow citizens to find their mayor, city council, local and regional representatives, and national government by simply typing in their postal code.

Source: <http://www.govfaces.com/en/>; (Alpict 2016)

However, the infrastructure resulting from the implementation of the eGovernment strategic plan 2016 will also contribute to the rise of Switzerland's e-Participation by taking advantage of the valuable base already available through eGovernment.

5.2 Trends in open government

Rooted in Western philosophical and political thought, democratic practice, and legal initiatives such as, e.g., the United States (US) Freedom of Information Act (FOIA) in 1966, *open government* has gained momentum as a way to innovate government actions and interactions with citizens through digital channels since the first Obama mandate, when on December 8, 2009, the White

⁷⁵ Swiss Confederation 2016

House issued an unprecedented Open Government Directive followed by the Memorandum on Transparency and Open Government, issued on January 21, 2009.⁷⁶ Open government implies a different perspective on innovation than e-government, due to e-government's interest in administrative activity performance rather than opening them to include citizens in service and government actions, policies, and politics, as in the case of *open* government.⁷⁷ Open data initiatives emerge as having a key role in enabling open government, probably necessary but not sufficient.⁷⁸ According to the Open Data Institute "Open data is data that anyone can access, use, or share." Open data includes data from various sources and providers, such as governments, scientific organizations, social media sites, and businesses⁷⁹. Furthermore, open data can come in many different formats, such as JSON, XML, RDF, spreadsheets, CSV, text Document (Word, ODF, OOXML, or PDF), plain text documents (.txt), scanned images (TIFF, JPEG-2000, etc.), or HTML.⁸⁰ In what follows we consider *open government data* as data produced and delivered by public administrations. It is worth noting that from this perspective, open data can be framed under what Dunleavy et al. have identified as Digital Era Governance (DEG), a complex change in society influencing government apparatus, perhaps in a primary fashion.⁸¹

Thus we consider open data as well as other digital innovation initiatives in the public sector as different kinds of what Misuraca & Viscusi call *digital governance systems*.⁸² The configuration of these systems depends on value drivers such as performance, openness, transparency, and inclusion.⁸³ With regard to these drivers, making data open and public has also been found to be relevant for fighting corruption. As reported by the *Economist*, British and Nigerian officials have used property and company registers published by several governments to investigate money laundering.⁸⁴ Furthermore, OpenCorporates, a website, lists the owners of more than 90 million companies from registers from over 100 jurisdictions, which is currently accessed and used by, e.g., law firms and tax authorities.⁸⁵ Further, the *Economist* merged the scores from the Open Data Index by the Open Knowledge Foundation⁸⁶ and the Corruption Perceptions Index (2014) by Transparency International,⁸⁷ identifying a potential association between them.⁸⁸ The results show that countries perceived as least corrupt, such as Denmark, also have higher scores in the Open Data Index.

⁷⁶ McDermott 2010; Wirtz and Birkmeyer 2015

⁷⁷ Traunmüller 2014; Viscusi, Poulin, and Tucci 2015

⁷⁸ Misuraca and Viscusi 2014

⁷⁹ Hammell et al. 2012

⁸⁰ Open Knowledge, 2015

⁸¹ Dunleavy et al. 2006

⁸² Misuraca and Viscusi 2014

⁸³ Misuraca and Viscusi 2014

⁸⁴ Out of the box 2015

⁸⁵ Out of the box 2015

⁸⁶ See the latest ranking at <http://index.okfn.org/place/>

⁸⁷ See the latest ranking at <http://www.transparency.org/cpi2015#results-table>

⁸⁸ Out of the box 2015

Key case - Open Data in Denmark: In 2002 the Danish Minister for Finance and the Danish municipalities established an agreement entitled “Better Access to Public Data” (often called the “free of charge agreement”), which made the address data produced by the municipalities in the 1990s (including geographic coordinates) available free of charge (paying only distribution costs) through a Public Data Server (PDS). In 2005, an amendment to Danish law removed the legal restrictions on the distribution of address data to third parties as well as the fee for distribution. This allowed the Building and Dwelling Register of Denmark to release its address data free of charge, without having to administer license payments or intellectual property rights. The agreement included a three-year compensation of EUR 1.3 million for the municipalities to balance the costs of distributing the data through the PDS, while municipalities were required to update data annually. In Denmark as well as other countries, a broad range of services depend on accurate, up-to-date address data, including emergency services, the police, postal and transport services, and Global Positioning Systems (GPS). According to a 2010 study by the Danish Enterprise and Construction Authority (DECA), the direct financial benefits of the open address data for the period 2005-2009 amounted to **EUR 62 million**, due to improved government back-end and efficient service delivery, while the total cost for the program was EUR 2 million. In addition, the benefits in 2010 were expected to be EUR 14 million, while total costs were EUR 0.2 million for distribution of the data through the PDS. The benefit was 30% to the public sector and 70% to the private sector, including Post Denmark (having its efficiency increased by access to the data) and the Danish emergency services (introducing a system built on standard car GPS navigation systems into 1,200 emergency vehicles, actually an alternative to more expensive mobile devices for alarm reception and tracking, with significant reductions in cost, response times and fleet efficiency). The Danish e-Government strategy from 2011-2015 expanded the program with “Good Basic Data for All” (the “Danish Basic Data Program”), aiming to provide further opportunities for the private sector. Basic data are the ones constantly used by the public sector in case processing, such as personal and company registration numbers, addresses, real estate data and physical and political mapping data. Since the establishment of the Basic Data Program, the private sector market for this data has grown with several new companies established, and other existing companies previously not working with geodata moving into the sector. For example, Septima, a geodata startup, was founded in 2013, offering products and services using open data, including data enhancement, such as calculating the distance between schools and houses; Web-based map components and search tools for public data; consulting to organizations like the Geodata Agency; and subcontracting to a large IT company involved in developing the distribution platform for the Basic Data Program. In addition, Danish insurance companies currently use elevation data to assess risks of flooding where they would have previously had to rely on aggregated risk by region.

Sources: (DECA 2010; Jetzek 2016; McMurren, Verhulst, and Young 2016)













In the case of Switzerland, while transparency is high (ranked #7 for Corruption Perceptions Index 2015), as also shown by the figures and tables in previous sections, the Open Data Index 2016 shows a country that is also lagging behind in Open Government Data (ranked #29 at the global level). Yet it is worth noting that Switzerland is in perhaps a more promising position for Open Government than for e-Government as shown by results of the Open Government Data Strategy for Switzerland 2014-2018, approved by the Federal Council on April 16, 2014, leading the country to have all the criteria (such as *Fiscal Transparency*, *Access to Information*, *Public Officials Asset Disclosure*, and *Citizen Engagement*) for being eligible as a partner (even if not yet participating) in the Open Government Partnership, a multilateral initiative globally launched on September 20, 2011, that aims to secure concrete commitments from governments to promote transparency, empower citizens, fight corruption, and harness new technologies to strengthen governance (see <http://www.opengovpartnership.org/>).

5.3 Summary

Table 23 provides a summary of the two main indicators considered above. Regarding *Institutions*, the tables above show at a global level a strength of Switzerland in property rights, political stabil-

ity, and reliability of institutions; whereas digital governance is currently a weakness due to the delays in government online service development and a low degree of e-participation; E-participation, however, is probably less important because of the high degree of participation through traditional channels, unlike in other countries.

Table 23. Comparative analysis of institutions and digital governance performance for Switzerland and top performers at the global level.

Indicator	Switzerland	Singapore	Finland	The UK	Luxembourg	The US
Institutions	 <p>Competitive for property rights, political stability, and reliability of institutions, while perhaps slightly weaker with regard to perceived burden of regulation.</p>	 <p>Competitive for property rights and the efficiency of legal framework, but presenting drawbacks with judicial independence.</p>	 <p>Leading for institutions at a global level, yet having drawbacks with regard to the perceived burden of regulation.</p>	 <p>Competitive for its institutions among the top performers for property rights but drawbacks in perceived wastefulness of public spending and burden of regulation.</p>	 <p>Competitive at institutional levels, yet weaker in perceived favoritism in decisions of government officials, wastefulness of government spending, and burden of regulation.</p>	 <p>Improving, with mostly positive property protection offset by large weaknesses in perceived favoritism in decisions of government officials, wastefulness of government spending, and burden of regulation.</p>
Digital governance	 <p>Improving in digital governance, with promise in open government if exploitation of the current infrastructure and participation can be achieved</p>	 <p>Leading for e-Government infrastructure with specific programs for businesses</p>	 <p>Competitive for e-Government services and among the global top ten performers for open government data.</p>	 <p>Leading for open government data and services infrastructure.</p>	 <p>Improving for both e-Government and open government.</p>	 <p>Leading for e-Government infrastructure and open government.</p>

To conclude, the institutional context presents characteristics that make Switzerland’s traditional brand of stability and reliability adapted to current digital markets, with the development of e-government and open government infrastructure not only as a way to solve the weakness related to the burden of regulation, but also to nurture new ventures in digital business through open data. The weaknesses identified could actually become a strength with the increasing attention devoted to open government and open data, which can give rise to business ecosystems to exploit them, with startups developing digital applications, e.g., for tourism or Fintech services.

5.4 Recommendations

These recommendations are based on research on the secondary data from the sources cited and primary data from interviews with experts. It seems clear that Switzerland, while in general enjoying reliable and competitive public institutions, is not currently considered to be a global leader in eGovernment services provision and e-Participation. However, the country is gaining momentum in open government data initiatives that can potentially contribute to the creation of new business models for supplying, aggregating, and enriching open data.⁸⁹ Thus in the coming years, Switzerland may want to consider prioritizing actions aimed at:

- *Efficiency*, by accelerating the digitalization of public services as a way to sustain the performance of institutional efficiency and accountability.
- *Accountability*, through positioning and branding strategies aimed to promote the attractiveness of Switzerland's open government data infrastructure for the development of new ventures in digital business.
- *Effectiveness*, by Identifying business models for the exploitation of open government data providing shared value to businesses and public administration.
- *Flexibility of regulation* in the digital space, to avoid preempting promising digital businesses from experimenting during their growth period and sending them to other jurisdictions, from which they can enter the Swiss market via the Internet but without many of the economic benefits to Switzerland. In essence, many of the attractive IT-driven markets are developing extremely quickly, while traditional regulatory approaches take a long time and are intended to last for decades. Some experimentation with regulatory "sandboxes" (don't regulate until the market is of a certain size, or until consumers claim to be harmed) along with the ability to rapidly revisit digital-oriented regulations, could be highly beneficial to growing digital businesses and keeping them based in Switzerland while they grow. This also applies to corporate ventures as well.

⁸⁹ Hammell et al. 2012; Janssen and Zuiderwijk 2014

Chapter 6 Society

Understanding the major characteristics of a society allows for a clearer picture of the overall context within which different elements are evolving and interacting, such as business and market systems, state policies, innovation, infrastructure and availability of online services.

This report seeks to present the current Swiss context as it relates to infrastructure, e-government, data services and startup ecosystems. A better understanding of the different dimensions of Swiss culture may help identify ways in which current barriers can be best modified, but also explain why they are there in the first place. Additionally, since each country is different, what works in one country may not work in another. For example, the United States' strong individualism is evident in certain attitudes towards how business should be done. The "American way of doing business" cannot easily be transplanted to another country, since many of the attitudes and behaviors are influenced by culture.

Switzerland is unique and while Swiss citizens may have an inherent understanding of what makes them and their country "Swiss," this section seeks to provide evidence for why this is so. Indeed, there may even be some surprises.

6.1 Better Life Index

According to the OECD Better Life Index, Switzerland is an excellent place to live. Residents have, on average, high disposable incomes and high household wealth. And, while money cannot buy happiness, it certainly helps increase one's standard of living. A higher standard of living is not always correlated with greater life satisfaction, but in the case of Switzerland, it appears to be.

Switzerland's economy is strong, as noted in section 2.2, and unemployment is low. 80% of the population aged 15 to 64 have a job, although this figure is lower for women (75%) and is also related to level of education.⁹⁰

Switzerland ranks high for health as well. In fact, the life expectancy is 83, higher than the OECD average. Switzerland also ranks high in community, which refers to the people one can depend on to help in case of need. This sense of community appears to be one of Switzerland's strengths when compared with other countries in **Table 24: Components of Better Life Index** below.

⁹⁰ OECD Economic Surveys: Switzerland 2015

It is important to note, however, that Switzerland ranks quite low in civic engagement. In this index, this means voter turnout. Civic engagement can take multiple forms, however, such as volunteering, engaging directly with political structures (local government, for example), or upholding one’s obligations as a member of a community. While voter turnout may be low compared to other OECD countries, Switzerland does have a strong “participative culture.” Certainly the high rank on the community indicator (9.9/10) reflects this. E-government initiatives, as mentioned earlier in this report, are also being developed to encourage and improve civic engagement.

Based on the Better Life Index, it is clear that one of Switzerland’s great strengths is quality of life.

Table 24: Components of Better Life Index

	Switzerland	Denmark	Sweden	Germany	Estonia	UK	Israel	Finland	Rep. of Korea	US
Housing	6	5.6	6.3	6.1	4.3	6.1	4.2	6.2	5.7	8.1
Income	7.4	3.9	5	5	0.7	4.6	3.5	3.3	2.2	10
Jobs	9.4	8	7.6	8.1	5.7	7.4	6.6	7	7.3	8.1
Community	9.8	9.5	8.3	8.9	7.1	7.8	6.1	9.4	0	7.4
Education	7.5	7.8	7.9	7.9	7.9	6	5.4	9.1	7.9	7
Environment	8.4	8.8	9.6	8.8	7.8	8.4	4.9	8.8	4.8	7.3
Civic Engagement	3.4	7	8.8	3.9	2.3	6.9	2.4	5.9	7.4	5.4
Health	9.1	7.3	8.7	7.1	4.4	7.8	8.7	6.9	4.7	8.1
Life Satisfaction	9.9	10	9	8.1	2.9	7.3	9.6	9.6	3.8	8.7
Safety	8.7	8.9	8.3	9	7.3	9.7	7.4	9.3	9.5	8.9
Life work balance	7.2	9.8	8.1	8	7.4	6.1	5.1	7.4	5	5.3

Popu- lation	7.9 million	5.6 million	9.5 million	81.9 million	1.3 million	62.6 million	7.9 million	5.4 million	50.2 million	311.6 million
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6.2 Cultural dimensions

Hofstede’s six cultural dimensions offer a high level overview of national cultures. This snapshot of a nation’s culture provides insight into behaviors that may influence numerous aspects of daily life, such as doing business, risk aversion, life priorities, and forming relationships.

For Hofstede, **“culture is defined as the collective mental programming of the human mind which distinguishes one group of people from another.** This programming influences patterns of thinking, which are reflected in the meaning people attach to various aspects of life and which become crystallized in the institutions of a society.”⁹¹

Based on these dimensions, it is possible to provide a general description of Swiss culture. Of course, it is important to keep in mind that these dimensions do not capture the complexity of a society. That said, interpreting the dimensions can shed light on why Switzerland may have certain strengths and weaknesses and act as a guide for areas where a cultural shift would be beneficial for achieving the *Dynamic Freedom* scenario or achieving a leading digital future (or both) all the while respecting the fundamentals of Switzerland’s culture.

The dimensions are measured out of 100.⁹² Switzerland has a relatively low score on the power distance index (PDI). “Power Distance is defined as ***the extent to which the less powerful members of institutions and organizations within a country expect and accept that power is distributed unequally.***”⁹³ In short, the PDI indicates how hierarchical a country is. In the case of Switzerland, the PDI is different in the German-speaking cantons (lower PDI) than the French speaking cantons (higher PDI, similar to France’s PDI of 68). PDI will influence expected behaviors within organizations. A country with a low PDI score, like Switzerland, would tend to have “company cultures” where the hierarchies are less structured, the bosses are easily accessible, team members expect to be asked their opinions and not given directives with no explanation.

The individualism-collectivism dimension measures **“the degree of interdependence a society maintains among its members.** It has to do with whether people’s self-image is defined in terms of ‘I’ or ‘We.’”⁹⁴ In a more individualistic society, like Switzerland, people are expected to take care of themselves and their close relations only (family, close friends) and not their community as a whole. Failure reflects poorly on the individual, not on a whole social/ethnic group. In a busi-

⁹¹ Hofstede and Hofstede 2002

⁹² Interpretations of the cultural dimensions are based on information found on <http://geert-hofstede.com>. For visual representations of the different cultures discussed in this section, please refer to <http://geert-hofstede.com/countries.html>

⁹³ Hofstede and Hofstede 2002

⁹⁴ Hofstede and Hofstede 2002

ness context, this translates as a merit-based system. Employees are rewarded for doing a good job, not because of whom they know.

The masculinity-femininity dimension reflects the degree to which a nation more closely adheres to stereotypical masculine vs. feminine traits. A higher masculine score means that success, ambition, competition and assertiveness are valued over traditional feminine characteristics, such as caring, modesty, cooperation, consensus building and quality of life. Switzerland is overall a more masculine culture, which means that material success is valued. In a business context, this could be manifested as expecting employees to be driven and managers to be direct. Again, there is a slight difference between the French and German speaking regions, with the German regions being more masculine and the French less so. Generally speaking, founders of startups present certain masculine traits, such as drive and ambition, given that growth and high financial return are drivers for founding these types of businesses.

Uncertainty avoidance (UA) is an important dimension for understanding how cultures deal with not being able to predict the future. A high UA score generally manifests in more rigid codes and less tolerance for unorthodox behavior. Rules, punctuality, precision, and security are all important. Innovation and change may be resisted. Switzerland's UA score is neither high nor low, which is interesting in that it may explain the blend of rules, punctuality and innovation that are some of the hallmarks of Swiss culture.

The long-term avoidance / short-term normative orientation dimension describes how a culture deals with the past, the present and the future. A country that scores low on this dimension will be more tuned to the past and therefore tend to reinforce traditions and be resistant to societal change. High scores reflect higher levels of pragmatism with a focus on thriftiness and education. "With a high score of 74, Swiss culture is definitely pragmatic. In societies with a pragmatic orientation, people believe that truth depends very much on situation, context, and time. They show an ability to adapt traditions easily to changed conditions, a strong propensity to save and invest. Thriftiness and perseverance in achieving results."⁹⁵ This dimension of Swiss culture may be able to be exploited so as to encourage greater adoption of digital technology.

The Indulgence-Restraint dimension is an interesting dimension, as it measures a country's tendency toward having a more fun-loving culture, versus one that "suppresses gratification of needs and regulates it by means of strict social norms."⁹⁶ Switzerland's score on this dimension translates into a culture where enjoying life and having fun is important. Countries with high scores on this dimension tend to have a positively perceived work-life balance and life satisfaction, which is in keeping with the OECD's better life index ranking.

These dimensions must be taken together in order to provide an overview of a national culture. Key features of Switzerland's national culture are:

⁹⁵ Hofstede, Hofstede, and Minkov 2010

⁹⁶ Hofstede and Hofstede 2002

- Flatter hierarchical structures
- Individual success is important
- Work-life balance
- Pragmatic culture (adapts to context)
- Take care of self, family and close relations

How does Switzerland compare to other countries? Below are a number of comparative charts that highlight differences between Switzerland's culture and a number of other countries. The purpose of these comparisons is again to highlight context. What works in one country will not necessarily work elsewhere. In other words, the United States' startup culture may not be exportable as is, but aspects of it may work well in Switzerland, for example.

First, let us compare Switzerland, Germany and the UK. These three countries are quite similar. The most striking difference is the UK's high score on the individualism-collectivism dimension, meaning the interdependence between individuals is very low. Furthermore, compared to Switzerland and Germany, the UK has a low uncertainty avoidance score. This means that knowing what to do, or how to proceed to reach a specific goal is not overly important as long as you get to where you want to go. Consequently, there are fewer rules to follow. This can be a positive trait in startups and innovative companies, in general. The UK is a creative country where differences are appreciated. It is also more oriented toward consumption than either Switzerland or Germany.⁹⁷ The UK scores lower than Switzerland on the long-term orientation dimension meaning that it is less of a pragmatic culture. Germany stands out from the other two countries on the indulgence-restraint dimension. It is a more restrained culture, meaning there is less emphasis placed on leisure and personal gratification.

Key case - Housetrip and Airbnb: Housetrip was founded in Lausanne by Arnaud Bertrand and Jujun Chen in 2010. The founders met while they were students at the Ecole Hôtelière de Lausanne. The Housetrip concept is to allow individuals to rent a whole home during a holiday, giving guests more flexibility than a hotel. Since 2010, the company has received over \$60 million in funding. Housetrip has 3 offices and employs more than 200 people. According to the company's website (housetrip.com), they have a 95% customer satisfaction rate and 24/7 customer service. The website currently boasts over 300,000 listings in 20,000 locations.

Airbnb was founded in San Francisco in 2008 by Joe Gebbia, Brian Chesky and Nathan Blecharczyk. Gebbia and Chesky met while they were students at the Rhode Island School of Design. The original Airbnb concept was to provide guests with a bed and breakfast experience in a private home. It has since evolved, as Airbnb lists both whole homes, as well as rooms in homes. In 2011, the company received \$112 million in funding.* In 2015, the company received \$1.5 billion in funding increasing its valuation to \$25.5 billion.† Airbnb currently has 19 offices. Its website (Airbnb.com) has over 2 million listings in over 34,000 locations that range from individual rooms to castles.

Housetrip and Airbnb offer similar services. One is clearly much better known than the other in large part due to the amount of funding it has received, which allowed for rapid growth, although rapid growth can also have negative consequences. Airbnb has been confronted by legal and quality control issues, unlike Housetrip.

*(Malik 2011)

†(Nusca, 2015)

⁹⁷ Hofstede et al. 2010

There are two key differences between Switzerland and the United States: the scores on the individualism-collectivism dimension and the long-term orientation-short term normative dimension. The US is one of the most individualistic countries in the world. Americans are self-reliant and do not expect much from their communities, or from their government. In fact, expecting the government to provide robust social services is often seen as a sign of weakness in the US. The US scores lower than Switzerland on the UA dimension. Consequently, American culture is open to new ideas, new ways of doing things and generally more accepting of ambiguity and uncertainty. There are fewer rules, less red tape and therefore innovative ideas can be put into practice quickly. Trying and failing is not necessarily viewed negatively in the United States.

The US scores very low on the long-term orientation/short term normative dimension, which is interesting. Despite being open to new ideas and putting ideas into practice quickly, American culture is not pragmatic. Americans have strong opinions about good and bad, right and wrong. Truth, for Americans, is not dependent on the context, but a fixed concept. In a business environment, this translates into more short-term vision. Performance is measured quarterly. “This also drives individuals to strive for quick results within the workplace.”⁹⁸ In other words, a product would not often be decades in development in the US.

6.2.1 Immigration

Switzerland has depended on both unskilled and highly skilled foreign labor for decades. Foreign-born residents made up 28% of the population in 2010. This is one of the highest rates in the OECD.⁹⁹ The majority of foreign-born residents are from the EU. The countries with the greatest representation are Germany (14.9%), Italy (15.3%) and Portugal (13.1%).¹⁰⁰ According to the Swiss Confederation’s website, one of the reasons for such a high percentage of foreign-born residents is due to strict naturalization regulations.¹⁰¹

In 2014, the “Mass Immigration Initiative” was passed. This initiative aims to limit immigration and will influence a number of treaties Switzerland has with the EU, its biggest trading partner. Although the initiative will not go into effect until 2017, some of the consequences have already been felt. Namely, enrollment of foreign students at Swiss universities has dropped, at times quite significantly (10-15% at UNINE, UNIL, EPFL and ETHZ). This could have an impact on the future of innovative ideas and business opportunities (see box below).

Expert insight: Immigration laws in Switzerland are considered a barrier to attracting talent to the country. In February 2014, Swiss voters very narrowly approved a popular referendum imposing quotas on immigration. The referendum had four major implications: (1) All immigration would be subject to quotas, including European Union migration, asylum seekers, and *frontaliers* (cross-border commuters); (2) Work / residency permits would be subject to economic tests; (3) All incompatible

⁹⁸ Hofstede et al. 2010

⁹⁹ OECD 2015

¹⁰⁰ “Nationalité,” Statistique Suisse, 2016.

¹⁰¹ “Acquisition de la nationalité suisse,” Statistique Suisse, 2016

international treaties must be renegotiated; and (4) Changes 1-3 above must be implemented by February, 2017.* The resulting law requires employers to show no Swiss workers qualify for a position before obtaining a work permit for a foreign national (though the rules are less strict for sectors with large labor shortages).

Given that Switzerland is a relatively small country, human resources (i.e., skilled talent) are not always readily available. Some of our experts felt that these changes could lead to an inability to attract talent to Switzerland in the quantity desired, either due to technical constraints (visa issues, etc.) or due to the perception that they would not be welcome. While the country has been working on limiting the fallout from this referendum, including a 2016 agreement regarding movement of people from/to Croatia, it remains to be seen whether the ICT sector will be severely challenged by this new environment.

* Judd, P. 2015. "A five-step guide to Switzerland's immigration changes." <http://lenews.ch/2015/03/17/a-5-step-guide-to-switzerlands-immigration-changes/>

6.3 Digital readiness

An increasingly digital society implies increased use of digital technologies on the consumer level, an increase in digitalization (and corresponding changes in business models), more government and associated services, as well as more prevalence of the Internet of Things. In countries like Switzerland that have high levels of ICT adoption, an important issue is the digital readiness of the population; In other words, effective use of ICTs and the Internet by the population. The more a population demonstrates high levels of digital readiness, the more a country can take advantage of the digital tools available to them. Digital readiness is increasingly important as more and more public services are offered online. Furthermore, connected devices (e.g., the Internet of Things when on a large scale) require new levels of trust and data sharing. Not having a clear grasp on what applications are doing with one's data will hinder adoption of these tools.¹⁰² Digital literacy is fundamental to digital readiness.

6.3.1 Digital literacy

Digital literacy involves a number of related skills, such as being able to find and evaluate information on digital platforms and devices, being able to use information from multiple digital sources, and the ability to complete tasks in a digital environment.¹⁰³ The results of the 2015 ECDL (European Computer Driving License) Switzerland study show that the Swiss population is lacking in computer skills and digital literacy. The key findings of the ECDL report were the following: The Swiss lack basic computer skills (overall score was 46/100 on a basic skills test). "The Swiss performed the best in using file management (39% scored good or very good) and in the area of using the Internet and e-mail (34%). Good or very good test result in Spreadsheets and Word processing was 29% and 28%."¹⁰⁴ As mentioned above, this is not necessarily due to poor access to digital devices. Indeed, the Swiss tend to be well equipped with digital devices. The ECDL concludes that, in the case of Switzerland, the lack of strong digital skills comes from a lack of structured learning.

Not surprisingly, young people are more digitally literate than older generations. 18- to 24-year-olds scored 59%, compared to 45.4% for 30 to 49 year olds and 30% for 50 to 64 year olds. That said, there is still room to grow. Digital literacy initiatives can be offered in traditional educational

¹⁰² Horrigan 2014

¹⁰³ "US Digital Literacy,"

¹⁰⁴ ECDL Foundation, 2015

settings, but also at the community level, or sponsored by companies and organizations. It is important to keep in mind that while digital natives may not have experienced the transition from a pre-Internet society, they do not have an inherent ability to use digital technology well.

Table 25 below is a composite of the Network Readiness Index (NRI) published by the World Economic Forum and the ICT Development Index (IDI) published by the International Telecommunications Union (ITU). The indicators included in the table offer a snapshot of digital readiness in Switzerland, the UK, the US, Germany, Denmark, and the Republic of Korea.

Table 25. Digital Readiness, composite of NRI and IDI indicators (rankings)

Country	Switzerland	UK	USA	Germany	Denmark	Rep. of Korea
NRI (143 countries)	6	8	7	13	15	12
NRI sub indexes:						
• Business & Innovation Environment	10	9	5	31	18	22
• Individual Usage	10	4	18	17	1	9
• Business Usage	1	16	7	5	8	12
• Economic Impact	3	13	7	9	18	10
• Social Impact	34	6	11	31	30	4
IDI sub-index: skills (167 countries)	48	44	5	33	12	2

What is clear from Table 25 is that Switzerland is at or near the top for the usage of digital technology in business settings and quite competitive for individual digital use and business / innovation environment (how much digital readiness contributes to entrepreneurship) but fairly far down the list when it comes to social impact (how much of an impact ICTs have on several social dimensions, e.g., government efficiency) and digital readiness skills. We have previously discussed (Chapters 2 and 5) Switzerland's relatively modest performance in government exploitation of ICTs.

6.3.2 Swiss connectivity

Switzerland has a 140% mobile phone penetration (World Bank), meaning that many individuals have more than one mobile phone. This is not actually an unusual phenomenon, but is telling regarding use, and explains the slight reduction in fixed telephone subscriptions over the past five years. Mobile broadband offerings have also helped spur the adoption of mobile telephony. Switzerland has seen a 34% increase in mobile broadband subscriptions across all linguistic areas, especially among households with children.¹⁰⁵ It is one thing to have access to mobile phones, mobile broadband, and the Internet at home and at work. It is another thing to use the devices to their fullest and yet another to actively create content.

¹⁰⁵ OFS, 2015

Switzerland is 5th in the Global Innovation Index's "Online creativity" ranking. This includes both Wikipedia edits and video uploads to Youtube. Of course, it can be argued that online creativity includes many other possible dimensions that would be worth measuring.

The Swiss population has easy access to the Internet and mobile phone services and clearly takes advantage of this. According to the OFS publication on Internet access and use, the majority of Swiss households have access to the Internet (83% in 2014 compared to 77% in 2010). The linguistic digital divide has also been reduced. The two major factors that play a role in Internet access in Swiss households are the presence of children and subjective financial situation (whether a person feels financially secure). Households without children may comprise older adults who may have a lower level of digital literacy and/or less of a perceived need for online services. However, with only 14% of households not connected to the Internet, Switzerland can be considered to be among the top connected countries.¹⁰⁶

Education plays a role in Internet use. 98% of tertiary graduates aged 25+ use the Internet, compared to 50% of non-graduates in the same age bracket. Internet use is also related to age, with older adults being less likely to use the Internet.¹⁰⁷ That said, use amongst all age groups has progressed since 2010. This is encouraging regarding a *Dynamic Freedom* future and/or digital leadership role. However, as new technologies are developed and new uses are created, it begs the question as to whether older generations will be open and willing to learn how to use new tools (Internet of Things and driverless cars come to mind).

6.3.3 Swiss Internet Use

Email and information seeking are the two most popular uses of the Internet among the Swiss. Consumer uses, such as e-banking and online shopping are also popular. Online sources of entertainment, while progressing, are still not as popular. This may be due to other options that are considered to be equally, if not more pleasurable (cinema, concerts, sporting events, outdoor activities...). Interestingly, the Swiss also use e-government services a great deal (79%).

Switzerland is above average in terms of high-speed connectivity by household (86%) and is ranked #6 behind The Netherlands, Iceland, the UK, Norway, Sweden and Germany.¹⁰⁸ It would be worth studying the policies and actions taken in these countries, notably the Netherlands (an increase of 15% in 4 years, from 80% to 95% of connectivity) and the UK (69% to 88% in 4 years) to see if there are any best practices, policies, actions, pricing schemes that could be adapted to Switzerland.

¹⁰⁶ OFS, 2015

¹⁰⁷ OFS, 2015











¹⁰⁸ OFS, 2015

It is important to note that use varies a great deal from country to country. Security issues, physical proximity to shops, banks and government offices and cultural preferences/traditions most likely play a role in how one chooses to use the Internet. It would be therefore be worth studying actual, perceived, and desired use to gain a clearer picture of what Swiss individuals, companies and organizations are doing online. Current data on business use of Internet and mobile broadband also seems to be lacking. Given that ICTs permeate all sectors of society, it would be useful to have a more accurate understanding of B2B and B2C use and applications.

6.4 Summary

The table below is a composite of the various indicators considered in this chapter. Switzerland is consistently ranked among the countries with the highest quality of life. Unemployment is low, salaries are high, and life satisfaction is one of the highest in the OECD. By all accounts, Switzerland is an excellent place to live. In terms of digital readiness, however, there is room for growth. Switzerland has a strong digital infrastructure and Swiss residents have relatively easy access to the Internet and digital devices. However, as services (public and private) and consumption activities move online, digital readiness takes on new importance. This is one area where Switzerland can improve by increasing the overall digital literacy of its population. A more digital literate society, coupled with effective data security laws should see an increase in trust in data-sharing, which will become more common in coming years. This is not just a Swiss issue, however. Digital literacy is lacking in many countries.

Table 26. Comparative analysis of quality of life and digital readiness for Switzerland and top performers on the global level

Indicator	Switzerland	UK	USA	Germany	Denmark
Quality of life	 Leading specifically in health, jobs, community, and life satisfaction	 Competitive Strong in safety	 Competitive Strong in housing and income; weak in work / life balance	 Competitive Strong in community	 Leading specifically in community, life satisfaction, and work / life balance; weak in income.
Digital readiness (room for improvement in digital literacy in all countries)	 Competitive Strong in business usage	 Competitive Strong in social impact of ICT use	 Competitive Strong in business and innovation environment	 Competitive Strong in business usage	 Competitive Strong in individual usage

6.5 Recommendations

- Digital literacy programs, both formal and informal, would increase the population's ability to effectively use digital devices. A more digitally literate population would mean more

overall digital readiness, thus laying the groundwork for a population that is ready to embrace a more digital society. This would also probably mean more openness to a Dynamic Freedom type future with more services moving online, a more dynamic digital economy, and more participation in online culture.

- Digital literacy programs can be spearheaded by educational institutions, charities and philanthropic organizations,¹⁰⁹ governments, and libraries.
- Develop a clearer picture of individuals' actual use, perceived use and desired use. This would help map the current digital society in terms of individual use and aid in identifying potential applications that could be developed and brought to market rapidly.
- A clearer understanding of B2B use and desired use would also strengthen digital adoption on the societal side.
- Based on the Better Life Index, one of Switzerland's strengths is quality of life. It is important to maintain this moving forward.
- As in prior chapters, consider pro-growth startup policies, including tax policies for startup valuations.
- If possible, reduce constraints on immigration of highly skilled workers, and develop positive marketing messages that they will be welcome here to counteract the negative publicity surrounding the 2014 referendum.
- In general, there seem to be cultural differences amongst the linguistic regions. This would seem to imply that there cannot be a one program/solution for all. Any program, set of expectations, etc. would need to be tailored to more local cultures.

¹⁰⁹ Horrigan, 2014

Chapter 7 Moving forward: opportunities and risks

7.1 Digital future: opportunities and risks

As we have seen above, Switzerland presents both strengths and weaknesses when it comes to achieving digital leadership or a *Dynamic Freedom*-style future—a future in which ICTs are ubiquitous and unavoidable. In this future, we would use ICTs for information gathering, communication, tracking our energy consumption and knowing what food to buy because our refrigerator has sent us a list automatically. Glocal markets will flourish and consumers will also be producers. Dynamic freedom means more flexibility, an increased ability to express oneself and be heard, and more business creation opportunities.

As with any technological innovation, however, there is a flip side. The future also means more reliance on digital technology, possible outsourcing of our ability to think critically to the Googles of the world; an increased digital divide between the haves and have-nots, even within Switzerland. Ethical questions regarding how data is collected, stored, and shared will become increasingly important to address. Health issues related to using digital technologies, such as headaches, insomnia, carpal tunnel syndrome, and accidents due to lack of concentration of both pedestrians and drivers, will also need to be addressed. And, how will an ever more connected society produce enough energy to power all these devices; where will we find the rare earth minerals needed to build these devices (will rare earth minerals become the new oil?); will we be facing new environmental issues such as landfills filled with digital technologies? Some of the negatives issues related to our digital future will fuel innovation, but there are problems that may arise that we have not yet foreseen. Moving forward, it is important to be aware of both the opportunities and risks that an increasingly digital society produces.

Expert insight: Questions regarding the speed of change were raised during our interviews. Do we need the latest devices? Do we really need to be connected all the time? Does society gain from increased connectivity? It seems that a lot of digital traffic is nonsense / counterproductive. Furthermore, there is pressure to participate. Digital communication moves quickly and we do not take the time to think about what we want to communicate. Therefore, misunderstandings are rampant. This is not a Swiss problem, but a worldwide one.

7.2 Swiss factors

7.2.1 Direct democracy

Strong direct democracy implies a certain level of awareness regarding perceived strengths and weaknesses of the current context and empowerment regarding the ability to make one's voice heard. This could mean that when a large enough segment of the population perceives the need to change regulations, or policies, that the change could be made with more ease than in a country with a more top down style of government. That said, the decentralized structure of the Swiss government means that there could be major differences between cantons with regard to setting up a business, investment schemes and taxation, for example. This could lead to a new form of digital divide within the country, where highly innovative companies and services are concentrated in just a few places. In short, conforming to the Silicon Valley startup model and not building a Swiss-style innovation ecosystem.

7.2.2 Size of the territory: small is beautiful?

Switzerland is a small country and therefore has a small domestic market. As we saw earlier, new Swiss enterprises have a strong international orientation. This strength should be capitalized on. Furthermore, the multilingualism of the Swiss population is also a strength, since entrepreneurs are able to more easily communicate with the surrounding countries thus making it that much easier to promote Swiss companies abroad and build partnerships, as well as use Switzerland as a test market for products destined for the European market. That Switzerland has four official languages also makes the country attractive to highly skilled foreign workers who have the competencies to help grow a startup.

Since Switzerland is small, with a small number of inhabitants, this does make it a challenge to compete on both the domestic and international markets. In other words, the size of the population leaves the country open to competition from larger companies from abroad. It is therefore crucial to identify sectors to strengthen on the local level and identify sectors where Switzerland could compete effectively on the global level.

If the push is towards increasing digitalization and increased integration of ICT into all sectors of society, then local Swiss companies and service providers are indeed at risk of facing competition from outside. However, certain companies already have the trust of the Swiss population and could exploit this to increase their market share in certain sectors by diversifying and offering new types of services (smart energy technologies by telecom providers, or health tracking by insurance companies, for example). Furthermore, the Swiss brand is recognized internationally and the Swiss start up ecosystem could make a concerted effort to capitalize on this as they seek potential customers abroad.

7.3 Digitalization opportunities: capitalize on Switzerland's strengths

7.3.1 Fintech: Swiss style financial innovation

Switzerland has the potential to be one of the key players in this market at the global level. This would tap into Switzerland's historical brand for banking and finance excellence, thus removing one of the barriers to success. Fintech can represent an occasion for a **Swiss style financial innovation**, particularly with regard to blockchain infrastructure governance and its potential application to areas such as smart cities and energy efficiency. Indeed, the Federal Council has already begun thinking about making changes in banking and finance regulations, specifically the Banking Act (BankA) to make the Swiss environment friendlier to Fintech.¹¹⁰ The Federal Council also indicated that some fintech firms could currently claim an exception to the BankA "(...) if they accept third-party funds solely for the purpose of forwarding them or paying interest and the processing (...) is determined beforehand. This is regularly the case for crowdfunding platforms.¹¹¹ This type of regulation change will make Switzerland a more attractive destination for innovative financial companies. Switzerland can also use its reputation for data security and privacy to its advantage in this sector.

Interest in Fintech is already growing within Switzerland and Zurich and Geneva are already on the map in this sector. Zug, as one of the foremost bitcoin startup hubs in the world, can only help increase Switzerland's visibility in this sector. Furthermore, Fintech is inherently international, given the way the financial markets function. Since Switzerland is very strong in the international orientation of their new enterprises, then this too can be used to encourage potential entrepreneurs in this area to come to Switzerland.

In order to further increase Switzerland's potential in this area, focus should be placed on increasing individual subscriptions to mobile broadband and encouraging individuals to use Fintech applications. It is worth considering the overall user/customer/ citizen experience. It would be also worth taking a closer look at ICT use and adoption of Fintech applications in Denmark and the UK in order to see whether some of the strategies used could be adapted to Switzerland.

Switzerland compared to London, New York, Hong Kong, and Singapore, is somewhat late to the Fintech game. London has become a hub for Fintech, especially equity crowdfunding, and the US just announced in May 2016 that it was allowing equity crowdfunding on a larger scale, making it more attractive as a Fintech site. However, Switzerland's relative position can also be used to the country's advantage since new technological advances in the sector can be readily adopted and deployed. There is less technology lock-in (when organizations adopt too early and then find it difficult to change due to technological constraints).

¹¹⁰ Meier 2016

¹¹¹ Meier 2016

7.3.2 Open data business opportunities: turning a weakness into a strength

Over the past few years, there has been much discussion and debate regarding big data and open data. Big data presents big challenges and potentially big opportunities for business and society. In order for a society to take full advantage of the opportunities big data presents, it is important to understand the dynamics that underlie the flows of data within the big data ecosystem. Furthermore, given the volume, variety, and velocity of big data, it is crucial to have regulations and policies in place that on one hand enable those who will be manipulating this data to do so effectively and on the other hand protect those people whose data will be manipulated. Additionally, as when any type of information becomes massively available and to a certain extent decontextualized, it becomes important to have policies and regulations/checks that are able to verify the veracity of the data collected and used.

As mentioned above, big data is big. However, exploring how to make sense of this data, specifically by extracting valuable information for decision makers in both the private and public sectors, is worth pursuing. Open data, a similar but different phenomenon, has been claimed to provide a means of making big data more useful, democratic, and less threatening; in sum while big data are defined by size, open data is defined by its use.¹¹² Anyone can access, use, or share it, and as mentioned in Chapter 5, it includes data from multiple sources and can come in many formats.¹¹³

Switzerland's infrastructure and overall innovativeness make it a prime candidate for spearheading innovative business and public sector uses of open data. Currently, Switzerland is not a leader in digital governance, because of delays in government online services and low e-participation rates. However, this weakness can be turned into a strength, as more attention is being paid to open government and open data, which can give rise to business ecosystems capable of exploiting this type of data. In short, this can give rise to innovative business models capable of exploiting open government data thus providing shared value to businesses and public administrations.

As mentioned, data security and user trust will be crucial to making this scenario happen. Switzerland can use its long standing reputation for security and privacy to be a precursor in terms of policy making in this domain. The country's size should potentially make collecting longitudinal data easier than in a larger country and thus be a leader in terms of best practices. In fact, Switzerland could be **the** trusted location for storing sensitive data, building on its reputation for quality, trustworthiness, and discretion if the correct infrastructure is put into place in both the private and public sector, and government policies favor data security and privacy (for example, the owners of servers will not own an individual's data, only the individual owns his or her data).

Expert insight: The twin issues of data security and trust arose again and again in our interviews. Many interviewees mentioned that Switzerland could use its reputation for security and privacy in the banking and finance sectors to its advantage. One way of doing this would be to create policies and regulations that set a path for policy makers around the world. Instead of following the leader, Switzerland would be the leader and create the rules of the game. Collecting large amounts of data depends in part on users' willingness to let third parties be privy to their data. This requires a

¹¹² Gurin, 2015

¹¹³ Open Knowledge, 2015

certain level of trust in the infrastructure, the companies (and/or government), and policies regulating collection, storage, and use of said data. This is an important challenge for Switzerland (and most countries) now and will be even more so in the future. Open data is a geopolitical issue. Switzerland can respond to the open data challenge by creating an environment where innovation thrives; by creating a “Swiss label” for local storage facilities and local operators in this area. Switzerland should also negotiate with international standards organizations so that the country takes a lead on the global level in this sector. Finally, in order to increase trust and consequently the readiness to share data, consumers need to be more digitally literate.

Some possible ways for capitalizing on open data are:

- Dynamic map and typology of Swiss open data enterprises;
- Encouraging Swiss open data business innovation through specific funding mechanisms, startup competitions, focused innovation hubs (similar to Zug and blockchain);
- Guidelines for policy makers regarding publishing open data and making it sharable, traceable and verified for third party use, specifically for entrepreneurs;
- Course material for those members of the public interested in learning more about open data and business;
- Open archive of best practices, strategies and challenges for current and future open data businesses;
- Creation of a Swiss Observatory for Research on Business and Social Value of Open Data; and
- Design and application of a framework for data collection and analysis.

7.3.3 Startup destination

Switzerland is already home to a large number of startups. It is, after all, one of the most competitive economies in the world and the most innovative. A number of initiatives aimed at increasing the robustness of Switzerland’s start up ecosystem have been launched in recent years. Venture Kick, Venture.ch, Swiss Start Up Challenge, Venture Pitch Zurich, Lausanne, Prix Créateurs BCVs are only a few of a long and growing list of initiatives. Many of these initiatives help with everything from transforming ideas into viable businesses, providing mentors and coaches, finding financing (CTI grants, venture capital...). These initiatives aim to make Switzerland even more attractive to future entrepreneurs, be they Swiss or from abroad.

“Overall, Switzerland is a fruitful breeding ground for startups due to its high innovation capacity. This innovative environment encourages and facilitates entrepreneurs to enter the markets with their novel products and services.”¹¹⁴ Furthermore, the survival rates of Swiss startups are above average: 80% survive the first year and 50% survive five years.¹¹⁵ This speaks well to the mechanisms already in place to foster innovative businesses over the long term.

¹¹⁴ Startup Monitor 2016

¹¹⁵ Startup Monitor 2016

Furthermore, Swiss companies look beyond the country's borders for new markets. And, importantly, fear of failure as a barrier to creating a business is even lower than in the US.

Expert insight:

According to our interviewees, a number of factors make Switzerland an appealing place to found a startup:

- The number and variety of incubators, accelerators and innovation hubs. Some of these are specialized, such as the SIX Fintech incubator. Others seek only to provide an exciting place for young companies to grow. Switzerland has some very good architecture schools, perhaps a collaboration between architecture schools and innovation parks could lead to some innovative structures that would help foster creativity in the resident companies.
- A good transportation infrastructure. Switzerland is a small country and being able to get around easily is a great advantage. This means deepening your network and meeting the people who can help you is just a train ride away. Cross-pollination of innovation parks and incubators should be encouraged—meetups, presentations, sharing skills and knowledge are all achievable in a small country. This also means that Switzerland does not have to conform to the Silicon Valley style start up ecosystem where most of the innovativeness, business savvy and financing is concentrated in one location. Switzerland can “spread the wealth” so to speak.
- The strong linkages between research and business is a strength for traditional Swiss startup companies in pharma, biotech and cleantech.
- Switzerland is known for its high quality workmanship and cutting edge research. It is known for precision, quality over quantity, incremental improvement and taking the time to achieve a high quality end product. These are all positive qualities. That said, the idea to market cycle tends to be long. If the cycle could be reduced, then Switzerland's startups could scale up more quickly and ultimately be more competitive on the global market. Switzerland is also known for expensive, high quality products. Innovation can also occur in the process—how the end product is produced so that the quality is still high, but the process is less expensive, thus lowering the overall price of the product.

There is some room for improvement going forward:

- More offering of practical business education in the applied universities and research universities would perhaps encourage more students with innovative ideas to take the plunge and start a company;
- Offering introductory business education at the primary and secondary school level would help in shifting the mindset vis-à-vis starting a business over the long term. This type of program could be integrated into different subject areas, such as mathematics, history and geography, science, social science and language learning, with a goal of teaching specific skills and illustrating how business is an integral part of society;
- Switzerland is an expensive country, but some companies may see that the benefits of being based in Switzerland outweigh the financial issues, so better financing tools could help offset this potential deterrent.

7.4 Barriers to digitalization

7.4.1 Immigration

Immigration is a major issue going forward. According to the 2015 OECD Economic Survey of Switzerland, seven EU-CH treaties may be affected by the mass migration initiative if it goes into effect. This initiative has already had an impact on foreign student enrolment at Swiss universities. Switzerland has a very high percentage of foreign-born residents, which means that this initiative could have an impact on more than a quarter of the country's residents and have negative consequences on the national economy, the country's reputation, and future growth.

If Switzerland wishes to become a startup destination and/or continue to grow in areas where it is already strong, viable immigration solutions will be needed. These could take the form of highly skilled immigrant visas, like in Canada, or a practical training visa for foreign students like in the US. A special startup visa could also make Switzerland more attractive to foreign talent.

7.4.2 Tax regulations and business funding

Current regulations regarding taxing startups are a major barrier to both the attractiveness of Switzerland as a startup destination and keeping innovative companies in the country. The other important barrier to the future of digitalization is the lack of funding for startups beginning to scale up. As we have seen Swiss startups tend to have a longer than average idea-to-market cycle for a variety of reasons (cutting edge research, precision, high quality products). These Swiss-style startups require additional funding at crucial moments in their lifecycle. If those opportunities are not available, these companies will move elsewhere, thus producing a brain drain that is detrimental to Switzerland's digital future. The tendency for investors to be risk averse is also hindering the development of funding mechanisms that correspond to the Swiss startup ecosystem.

Changes have begun to be made. The exemption of Fintech companies from certain banking regulations is a smart move. The recent changes to tax regulations in Zurich is a step in the right direction. These types of changes are needed to boost Switzerland's appeal.

Expert insight:

Changes in taxation and improving funding opportunities were recurring themes in our interviews. Below are some of the key insights from our interviewees:

- Changes in taxation to increase economic activity.
- Bankruptcy laws should be simplified, as should policies regulating business ownership.
- Business-related procedures (setting up a business, registering the business, opening a business account, hiring and firing...) should be streamlined and simplified. Being able to do most of these procedures online would make doing business in Switzerland more attractive. E-governance of business regulations is an area to focus on.
- It is too difficult for young companies to get loans. Institutionalizing loans for small companies so that they are provided the opportunity to also scale up in debt, rather than exclusively in equity would be beneficial.

7.4.3 Improving Swiss digital readiness

In a future where society is ever more connected, digital readiness takes on new importance. Overall, ICT use does not need to increase. In fact, Switzerland may be reaching close to saturation in ICT use. That said, as we saw earlier, mobile broadband subscriptions are lagging behind the top countries (Denmark, the UK). In and of itself this is not a major problem, but it appears that mobile broadband use is linked to Fintech use. It would make sense that Swiss banks focus on gaining domestic customers as well as international ones. Therefore, this is an area where there could be some improvement.

In those households without Internet access, the main barrier is perceived need. In other words, households without Internet access do not see why they need the Internet. It could be that this population uses the Internet elsewhere, such as at work, or in public spaces like libraries. This population is not very large, however in a *Dynamic Freedom* scenario, the Internet and all things

digital will be ever more integral to daily life. It is therefore important to accompany this segment of the population into the digital age so that they will not be left behind and consequently be further isolated and “disconnected” from the rest of society.

Digital literacy scores are not currently stellar in Switzerland and could definitely be improved. It is one thing to increase overall use, it is another to make sure the population actually uses digital technology wisely, safely and is able to get the most from it as possible. The Internet offers more and more interactivity and can also be a creative outlet. These types of uses can create demands for new types of technology. It would therefore be helpful to develop digital literacy strategies aimed at different age groups and different types of communities (rural, urban, different linguistic communities, different socio-economic communities, interest groups...).

7.5 Conclusion

As John Elfreth Watkins Jr. proved in his famous article “What May Happen in the Next 100 Years”, published in the December 1900 issue of *Ladies’ Home Journal*, predicting the future is a tricky game. Switzerland’s digital future will depend on citizens, policy makers, and entrepreneurs at the local and global level. What we have aimed to do in this report is focus on 5 current trends in digitalization: digital infrastructure, startup ecosystems, data governance, the digitalization of the public sector, and societal trends, and identify Switzerland’s strengths and weaknesses compared to other countries in the world. Based on our research and a series of interviews we conducted with experts, we crafted a number of recommendations that would help Switzerland become a world leader (where it is not already) and continue to grow in areas where it is already well established.

In this chapter, we have focused on key areas where Switzerland could lead in terms of digitalization. Some of these areas, such as Fintech, are emerging fields where Switzerland could exploit its historical standing to become the one to follow. In other areas, like startup ecosystems, Switzerland has the opportunity to play the game its way, instead of playing by someone else’s rules.

There are, of course, barriers to achieving success and becoming a major player on the world stage. Some of these barriers are not specifically Swiss, such as digital readiness. Others have a Swiss flavor, but are present in countries around the world, such as immigration. And others, namely investment mechanisms and taxation, are dependent on a specific Swiss context.

Our recommendations are just that, suggestions that our experts believe could help Switzerland achieve a very positive digital future. However, unlike John Elfreth Watkins Jr., we do not claim to be able to predict the future accurately. We hope that taken together, our assessment of Switzerland’s current position and our recommendations will propel Switzerland to a leadership position in the global digital economy and keep it there for a long time to come.

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