Swiss SupplyChainTech

The State and Development of the Swiss Start-up Ecosystem

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Contents

1 Introduction

The importance of supply chains is becoming more and more apparent due to the current Corona situation. It has also become more present in society: Be it through bottlenecks in the availability of goods, the increasing volume of online trade or in the context of the vaccine supply. There is also a growing awareness that companies and their products can only be as sustainable as the suppliers and further sub-suppliers involved in their production, right up to the raw materials. To meet economic, ecological and social challenges, the design of supply chains plays a central role - more than ever. Innovative technologies, applications and processes are needed for these.

While technology-oriented companies in the financial and medical sectors, for example, position themselves publicly as "FinTech" or "MedTech", this appears to be less pronounced in the fields of logistics and supply chain management (SCM). An analogous discussion and positioning as "SupplyChainTech" can and should be strengthened.

The "Swiss SupplyChainTech" (SSCT) initiative launched at the Bern University of Applied Sciences in the Department of Industrial Engineering and Management pursues the objective of bringing more transparency to the "solution space" and thereby highlighting which innovative technology-based solutions exist for the fields of logistics and SCM. The initial phase of the initiative focused on in the identification of Swiss start-ups – a database has been created for the 130+ identified start-ups, which includes their product solutions and services. A supplementary online survey examined these "young" companies in more detail on aspects such as their technology base, customer base, growth plans or forms of financing. A total of 47 start-ups took part in the survey, which was conducted in the period 12/2020 - 01/2021.

2 Overview of Technology and Application Fields

In a heterogeneous field such as logistics and SCM, defining suitable categories to classify the start-ups is challenging: overlaps and ambiguities of the fields of application as well as trade-offs between the number of categories and the number of companies per category were considered. Based on common frameworks, functional areas, technology terms, and the input of the start-ups, 15 categories were defined, and a mapping of the start-ups is constantly being carried out as illustrated in Figure 1 (in alphabetical listing, no multiple mapping of the start-ups, status: December 2021):

- Additive Manufacturing (#8 start-ups)
- Blockchain (#9)
- City Logistics, Last Mile & Transportation (#13)
- Compliance, Contract & Content Management (#7)
- Data Analytics & Information Systems (#9)
- Drone Technology (#9)
- Food Supply Chain (#6)
- IoT Solutions & Devices (#6)
- Mobility Solutions & Fleet Management (#10)
- Monitoring & Transparency (#13)
- Packaging / Bins / Containers (#8)
- Robotics & Intra Logistics (#11)
- Shipping Management & Transport Platform (#7)
- Sourcing, Procurement & Materials Management (#13)
- Sustainability (#7)

A detailed look at the start-ups per category shows a broad spectrum of solutions for the needs and challenges within and along supply chains.

A considerable number of start-ups provide solutions for the realisation of mobility and the distribution of physical products. A wide variety of innovations can be observed in the categories **"City Logistics, Last Mile & Transportation"**, **"Shipping Management & Transport Platform"** and

"Packaging / Bins / Containers". For start-ups concerning unmanned aerial vehicles, the category **"Drone Technology"** was introduced.

The innovations in these categories range from complete tunnel logistics systems to smart, sustainable and energy-efficient containers, flexibly scalable and robot-assisted fulfilment and last mile solutions, marketplaces for packaging solutions, drones and related technologies and autonomation solutions, platforms for connecting retailers, shops, courier services and end customers, and control towers for managing the various logistics service providers involved or cargo space shipment sharing.

Another relatively large number of solutions address the increasing need for transparency and visibility in the supply chain, which are grouped in the category **"Monitoring & Transparency".** With the help of real-time monitoring systems for goods and predictive analytics, it is possible to exert a controlling influence on the material flow. Furthermore, compliance with quality requirements, inventory optimisation, route optimisation or exception handling, for example, can be made possible. Some of these solutions are specialised in cold chains, which reflects the great importance for the food, pharmaceutical and chemical industries. The category also includes concepts for brand protection/counterfeit protection and proof of origin: these are based on counterfeit-proof and unambiguous product labelling – including on the basis of DNA technology.

There is a close connection between the described category "Monitoring & Transparency" and the category **"Blockchain".** Blockchain solutions pursue goals such as preventing manipulation or making movements and transactions persistently traceable. In this way, trust in the most diverse information, material and financial flows and trust between actors can be strengthened. A mostly unresolved end-to-end coordination and traceability becomes more tangible. Blockchain solutions can be found in the expansion for particularly sensitive goods, but also in various areas where customers and stakeholders can benefit from access to transaction history. The providers of blockchain solutions have great potential not only to limit their solutions to this technology, but to develop them more comprehensively in the direction of the Internet of Things (IoT).

The **"IoT Solutions & Devices"** category includes providers of basic IoT infrastructures as well as service providers who connect existing infrastructures/objects and make them "intelligent". Products and services range from transparent and automated warehouse management to solutions for predictive maintenance and the control of filling levels in waste logistics.

Following on from IoT concepts, it has been successfully demonstrated in recent years how 3D printing technology can be successfully used in spare parts logistics or prototype construction in a wide range of industries and has reached market maturity. In addition to "pure" printing services, the start-ups in the **"Additive Manufacturing"** category also offer supporting services such as the selection and introduction of printers to customers or the (re-)engineering of printable components. Also, an established marketplace for additive manufacturing services is existent.

Surprisingly few solutions are found in the category **"Sustainability"** according to their primary focus. This category includes CO2 calculators for transports, solutions to improve transparency along the value chain with regard to sustainability practices, to analyse climate risks, to support sustainability reporting, and a marketplace to promote the circular economy. In addition, more hardware-oriented solutions are available that reduce emissions in shipping or monitor pollutant emissions in order to derive optimisation models. It should be noted, however, that in the other 14 categories there is a considerable share of solutions that make valuable contributions to sustainability (e.g., reusable containers, energy efficiency, transport bundling, etc.), but have been assigned elsewhere due to their specific functional focus. In order to do better justice to this aspect, efforts are being made to present additional dimensions in the start-up map in the future.

The products within the category **"Food Supply Chain"** have large overlaps in terms of content and function with those in other categories but are specifically geared towards food supply chains: For example, they feature technologies for food safety compliance or traceability back to the producer.

Food-specific, insulating reusable containers exist that are connected to blockchain solutions via populated devices (sensors, IoT gateways) and enable condition monitoring.

The pursuit of a "data-driven" supply chain is further documented by the category **"Data Analytics & Information Systems"**. Within this category, there are solutions that have been developed specifically for the supply chain context and those whose competence lies in data analysis in general and covers other fields as well. The majority of solutions in this category are based on the analysis of large amounts of data (structured or unstructured), reduce complexity, recognise patterns, build models and support decisions, or offer the prerequisites for process optimisation and automation. According to the current technology trend, artificial intelligence (AI) and machine learning approaches are being pursued. Fields of application can be found along the entire value chain. Exemplary applications range from dashboards for decision preparation, event and scenario analyses, market analysis tools (e.g., demand or price developments) to transport optimisation. Data can be integrated directly from a wide variety of historically grown systems. There are also solutions that pragmatically transform Excel analyses, as they are still "lived" in almost every organisation today, into more robust and user-friendly apps.

The category **"Compliance, Contract & Content Management**" includes a broad spectrum of solutions: the focus is on software for digital customs processes, trade compliance and preference calculations. In addition, there are concepts for automated document management and software solutions that check contracts for critical elements for purchasing and sales.

The continuous improvement of sensors, actuators, computer vision and artificial intelligence enables new solutions and fields of application in **"Robotics & Intra Logistics"** – and not only in the environment of large companies or serial production. Examples can be seen in mobile robots for inspection and cleaning as well as for collaborative support in manufacturing, warehouse management and picking for the last mile. The category also includes software applications that simplify the programming and teaching of robots or enable simulations.

The category **"Mobility Solutions & Fleet Management"** does not directly correspond to the planning, control, or optimisation of value chains. Nevertheless, it shows potentials for how solutions can be transferred into new fields of application. For example, on-demand passenger transport was subsequently extended to goods transport. Other innovations include new forms of mobility for employees in the warehouse environment or new approaches to fleet management. Analysis tools help to analyse passenger and traffic flows and thus improve networks.

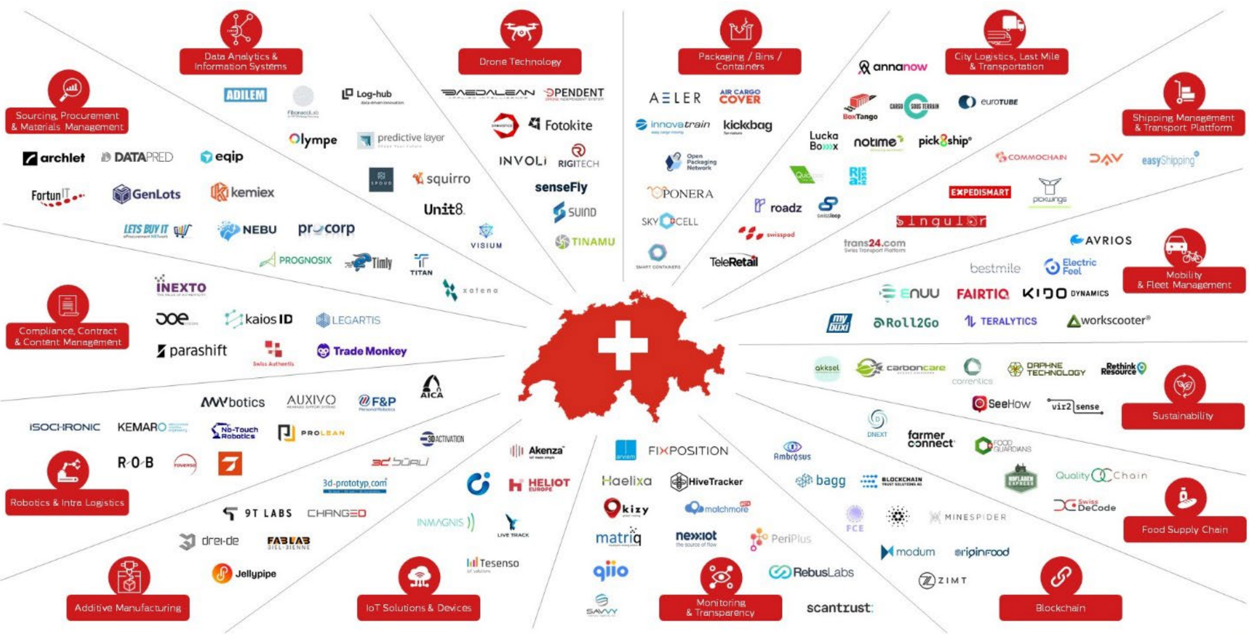

Figure 1: Swiss SupplyChainTech Start-up Map with 15 Categories (version: 12/2021)

3 Characteristics and Orientation of the Start-ups

Years of Foundation. According to studies, around 300 technology-oriented start-ups are founded in Switzerland every year. As the Swiss Start-up Radar 2020/2021 shows, there was a slight slowdown in the number of start-ups in the high-tech sector during the ongoing corona situation in Switzerland, but the number of start-ups remains at a relatively stable level (*Kyora & Rockinger, 2021*). The analysis of the founding years of Swiss SupplyChainTech (SSCT) start-ups shows an average number of around ten SSCT start-ups per year for the last ten years - but with a significant increase from 2016 to around 20 per year. This level can be expected to be maintained (at least) or to grow in the coming years, as the need for solutions to address challenges in (global) value networks is greater than ever.

Technology Base and Trends. A comparison between general technology trends and the use of these by SSCT start-ups reveals that, according to the start-ups, over half (53 %) are pursuing artificial intelligence approaches and using Big Data. Just under half (48%) rely on strong connectivity and link their solution to the Internet of Things (IoT). Both approaches are prerequisites for both optimising connected processes and automating them more. Surprisingly, relatively few automation solutions (10%) based on physical robots and software robots (RPA, robotic process automation) are found in the products.

Although disruptive innovations such as a complete tunnel logistics system or hyperloop developments are not discussed as independent technology trends, these innovations emerging in Switzerland offer far-reaching opportunities for further solutions and business models in the future logistics environment.

So far, the technological possibilities to connect the products to platforms such as the SAP Business Technology Platform, Amazon Web Services (AWS) or Microsoft Azure remain largely untapped - this approach might take on a significant role in the future, especially for start-ups with the potential to scale their products more quickly and to increase their market reach more quickly.

Development Times. The technological complexity of supply chain solutions is reflected in the development time. The majority of start-ups (60%) report a product development time to the so-called MVP (Minimal Viable Product) of 12-24 months. A noticeable proportion of start-ups (25 %) report a longer development time and only a small proportion (15 %) report a realisation time of less than 12 months.

Number of Employees. The number of employees per start-up varies significantly from 1 to 100 according to the heterogeneous product portfolios and is on average 16 (median: 10 employees) with an average company age of approx. 5 years (median: 4 years). Characteristically for start-ups, 88% of respondents stated that they currently expect continued to even strong employee growth - this is all the more remarkable given the current corona situation.

International Orientation. The international orientation of start-ups also serves as a basis for growth: 90 % of start-ups report at least 10 % or more as the share that their international customer base currently accounts for, and still 60 % of start-ups report that the majority (i.e., > 50 %) of their customers come from abroad.

Industry Focus. Looking at the target industries for which the start-ups provide their solutions, a broad distribution across all industries becomes fundamentally apparent. However, three sectors stand out: two-thirds of the start-ups each name "logistics & transport" and "food", and half name "pharmaceuticals & chemicals" as one of their central sectors.

Financing. Due to the technological complexity, SSCT product solutions can be investment-intensive at the beginning and access to outside capital can therefore play a decisive role. Venture capital is seen in almost half of the sample (48 %) and thus as the most common form of financing. However, just under a third of the companies pursue "bootstrapping" and do without outside capital (30 %). Support for product developments was also mentioned in the form of national and international research funding (13 %). Crowd funding appears to play a subordinate role (5 %).

Locations. The headquarters of the start-ups have a clear concentration in the canton of Zurich (#49 start-ups, 36 %) followed by Vaud (#28, 21 %) - this in a comparable proportion to that observed across the entirety of technology-oriented start-ups (cf. *Kyora & Rockinger, 2020*). Zug (#11, 8 %), Bern (#9, 7 %) and Geneva (#8, 6 %) still show a noticeable clustering. Surprisingly, Lucerne (#3, 2 %) and Basel-Stadt (#2, 1 %) show a small cluster. No SSCT start-ups have yet been assigned from the cantons of Appenzell Ausserrhoden, Appenzell Innerrhoden, Jura, Nidwalden, Uri, and Thurgau.

Figure 2: Selected Key Figures and Development of the Start-ups

4 Outlook

The overview of the SSCT start-ups shows a broad spectrum of solution approaches for the challenges in supply chains and logistics. The approaches are aligned along the entire value chain, i.e., they cover fields of action and processes of the upstream and downstream supply chain as well as the internal supply chain. The added value of the solutions increases further if the start-ups manage to offer their approaches in a simple way that can be "integrated" into existing systems and platforms - and to increase connectivity and interoperability overall. Interested companies can thus make decisions in favour of "young" providers easier.
This mapping is a starting point for the further establishment and expansion of the Swiss SupplyChainTech initiative. The aim is to realise synergy potentials between the players, further support the scaling of solutions and promote further research and innovations.

5 Bibliography

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