DETAILED ANALYSIS OF COMPANIES –

HOW THEY REACTED TO CRISIS

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1. Introduction

Aesop tells us the famous fable of The Oak and The Reed, conversing about their resilience in the shadow of crises. The oak is proud to be standing tall, made of heavy wood, rooted strongly in the ground. The Oak claims he can survive anything. Yet, says The Reed, the great storm will break you in half, while I will just simply bow and survive the tornado. So, what is the nature of resilience? What characteristics and factors make plants – or, lets ask, companies – resilient in times of crises?

In the framework of the 4STEPS project, a detailed analysis of various resilient behaviour of Hungarian companies (SMEs) has been studied and presented. In this report we aim to identify and characterise some of the main features of resilient behaviour based on company-level interviews and desk research. Our goal is to provide a pilot qualitative analysis of how the companies, in these various groups, operated, worked, went through their crises and stood up, walked on. The types of shocks as well as the types of reactions and firm -level behaviour are different in each case, yet, indication of resiliency capacity is expected to emerge from this qualitative effort.

There are many things that can cause a crisis in the life of a business. There are comprehensive economic crises, such as the global financial and economic crisis of 2008-09, which affected all aspects of life and business. There are crises that do not affect all sectors equally (such as COVID-19: although it has an impact on tourism and the food industry, the effects are not comparable). Radical sectoral regulation, product fee changes or an increase in the minimum wage for skilled workers may also pose a crisis situation for certain sectors.

However, crises can be completely unique and company-specific. The withdrawal of the largest customer, the termination of the most important supplier, or the loss of important key people from the organization can also lead to an unexpected shock situation for a company when it comes to creatively solving the problem and finding a way out, moving forward.

Resilience works in economic life in the same way as it does in the human body. One can be so resilient (so-called proactive resilience) that the crisis does not spectacularly tear up (although it may be, that its peers, competitors in the sector or region are falling back), it is also resilient to those who feel the crisis but shake themselves in a short time, adapt quickly (adaptive resilience), and are also considered resilient who can find a way out of the downturn and recover from losses (reactive resilience).

Our questions try to assess what external and internal tools a company can use to recover from a difficult situation after an economic downturn. Based on data from public balance sheets and profit and loss accounts, we filtered out businesses that showed signs of resilience following a business downturn in a given year. In this upcoming phase, we build on interviews, surveys and publicly available data (from company websites, media) to take one step ahead of understanding factors of resilience.

2. A short overview of the quantitative analysis

In the framework of the project, the study " *D.T3.7.1: Segment definition and characteristics of companies how they reacted to crisis*" analysed in details the database covering more than 26 000 company's data, including 73 different variables, covering the period of 2002-2019. Analysis was mainly focusing on annual revenues and sales growth.

The companies were representing various manufacturing industries:

- 31: Furniture production
- 25: Manufacture of fabricated metal products
- 33: Repair and installation of industrial machinery, equipment and tools
- 10: Food production
- 47: Retail trade, except of motor vehicles and motorcycles
- 46: Wholesale trade, except of motor vehicles and motorcycles
- 22: Manufacture of rubber and plastic products
- 28: Manufacture of machinery and equipment n. e. c.
- 26: Manufacture of computer, electronic and optical products
- 16: Manufacture of wood and of products of wood and cork, except furniture
- 27: Manufacture of electrical equipment
- 23: Manufacture of non - metallic mineral products
- 29: Manufacture of road vehicles

Among the company set, four main categories were identified and tested for their resilience performance. A control group was also identified in the framework of the above analysis. As the report defines, the categories are:

- **Fragile**: Annual revenue($year_{i+1}$) < Annual revenue($year_i$) or
  (Shock level)% > Sales Growth($year_{i-1}$ -> $year_{i+1}$) > -100%
- **Robust**: Annual revenue($year_i$) < Annual revenue($year_{i+1}$) < Annual revenue($year_{i-1}$) or
  0% > Sales Growth($year_{i-1}$ -> $year_{i+1}$) > (Shock level)%
- **Resilient:** Annual revenue($year_{i-1}$) < Annual revenue($year_{i+1}$) < 2*Annual revenue($year_{i-1}$)
  or 100% > Sales Growth($year_{i-1}$ -> $year_{i+1}$) > 0%
- **Antifragile:** 2*Annual revenue($year_i$) < Annual revenue($year_{i+1}$) or
  Sales Growth($year_{i-1}$ -> $year_{i+1}$) > 100%[1]

The fragile companies are not analysed in this part of our work, only the robust, the resilient and the antifragile. In addition, a control group – who have not shown the economic data to go though a crisis period – is also presented.

[1] the year of economic disturbance as $year_i$, while the previous one with $year_{i-1}$ and the year of comeback with $year_{i+1}$

3. The qualitative approach

In the qualitative phase of this research we look for the secrets, causes and tools of perseverance and resilience in businesses. We would like to know how a company recovers from a crisis, what external and internal resources it relies on in this process, and what solutions can serve as an example for other businesses. Furthermore, this report hopes to initiate the elaboration of a methodology for selection, question and analysis of these companies.

In the Introduction we presented the different types of shocks companies can face. The reasons behind resilience can be just as varied as the shocks hitting the companies. From our data-based quantitative analysis, the shocks themselves are not always transparent. Shocks can be:

- Global, such as the 2008/09 economic-financial crisis or the COVID-19 pandemic
- National (though affecting others on a global scale) such as the BREXIT was for the United Kingdom's economic actors,
- Regional, as in natural disasters
- Sectoral when certain sectors are hit more heavier than others

Since not only crises/shocks, but "resilience" patterns can also be very different, a systemic approach shall be designed that watches out for internal as well as external factors that can lead to resilience. As a hypothesis, **we suggest to identify the following tools/means for a company to react in times of crisis**:

Financial positive:

- Availability of existing company funds, equity
- Availability of short-term loans from the bank sector
- Availability of short-term loans from other F&F&F (family, friends and fools)
- Availability of state support
- Availability of long-term loans from the bank sector
- Availability of other financial assistance

Financial negative:

- Reduction of general operational costs (on overhead, etc)
- Reduction of salaries of top-level management
- Reduction of middle-level management salaries
- Reduction of general salaries
- Reduction of workforce
- Reduction of costs on incoming supplies
- Reduction in costs in any other way:

Managerial:

- Special capacities or skillset of the top-level management/owners:
- Special capacities or skillset of the middle-level management
- Hiring new staff with special capacities or skillsets
- Involvement of external managerial support, consultants, etc.

Labour force and organizational structure:

- Hiring
- Any change in the structure of the labour force
- Organisational change: re-organising the company's departments, units
- Changes in the remuneration and motivation tools for the labour force
- Changes in the flexibility of the workforce (in hiring techniques, etc.)

Products/Services:

- Changing the products/services portfolio

Technological:

- Introducing a local technological innovation with the existing production technologies (machinery)
- Introduction of new production technologies (machines)
- Introduction of a new software /ERP/CRM etc solution,
- Introduction of new production methods (re-organising the production chain)

R&D:

- Launching new R&D activities
- Launching new innovation and technological development of products/services
- Finishing R&D activities (and either closing the activity or reaping its benefits)
- Finishing innovation and technological development of products/services (and either closing the activity or reaping its benefits)

Clients:

- Contracting new clients
- Contracting new clients in a new geographical area:
- Renegotiating contracts with existing clients

Suppliers:

- Contracting new suppliers
- Contracting new suppliers in a new geographical area:
- Renegotiating contracts with existing suppliers

Packaging, marketing, sales:

- Any change in packaging
- Any change in your marketing
- Any change in your sales techniques

Trainings

- Any training at the the top-level management/owners
- Any training at the middle-level management
- Any training for the workforce

Professional assistance at the top level

- Any mentoring, coaching, human support for the top-level management/owners
- Any mentoring, coaching, human support for the middle-level management

In the current phase of research, we built this pilot qualitative effort on the following sources:

- Interviews, previous surveys, etc
- The companies' own website's public data
- Information, news in the media (traditional, online and social as well)

We present here the case studies from 12 companies. Importantly, the data and information below also includes information provided in interviews and surveys. **Therefore, in the description we identify the companies coded, as C1…C12. The exact names are given in an Annex, requested NOT to circulate publicly.**

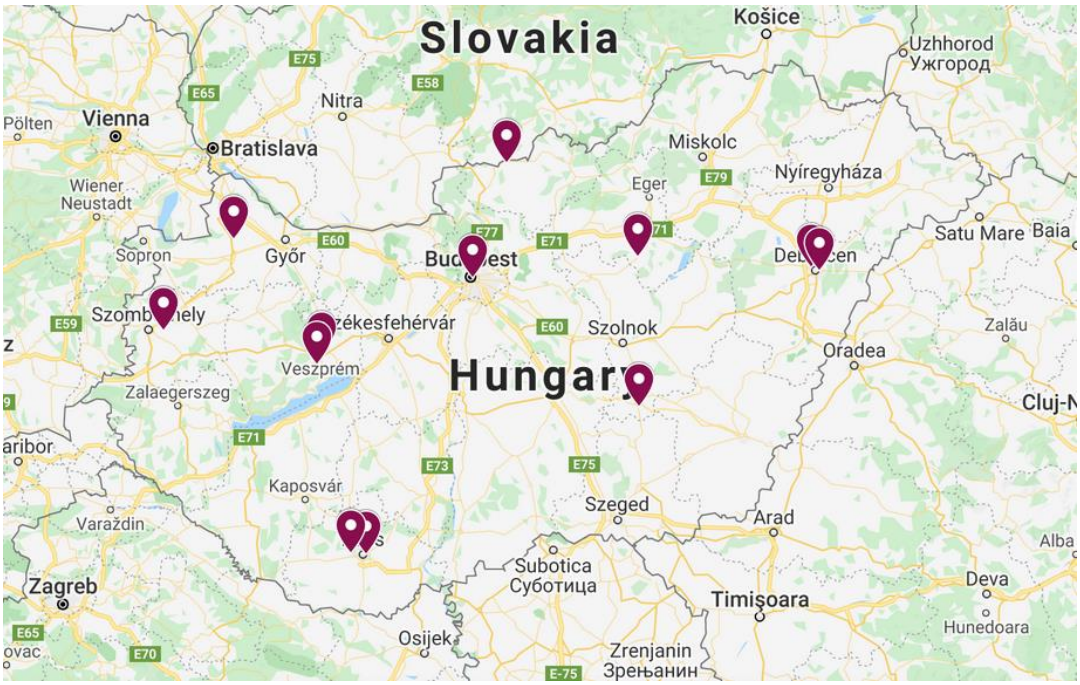

Figure 1: Map of Hungary with the location of the headquarters of the companies presented in the case studies

4. Case studies

In this chapter, we present 12 different case studies on companies, identified with various resilience trends. In order to preserve the relative anonymity of the companies, we provide codenames here and the list of companies covered is provided in the Annex.

In the case studies below, we highlight the information that tends to suggest a factor behind resiliency, though in case of individual shocks, the exact factor-and-effect mechanisms may not be identifiable.

4.1. Case study #1

Company C1 - Robust

The predecessor of the company was founded in the mid-eighties, by the Water Management directorate of the back-then socialist state. The management of the company has bought out C1 in 2003, it is in private ownership since. Two major investment/development periods were initiated, one in 2008, one in 2016. (The fallbacks in sales and revenues are partly connected to this history of the company – a poor performance of 2004 was followed by a robust behaviour in 2005, and 2016 was also a low point, counteracted in 2017 with a resilient comeback.) Currently it employs apx. 50 people.

The company produces summer and winter equipment and machinery (snowplows, salt dispensing, mowing, etc equipment) and forestry machinery. This industry is not top-trendy IT, it serves a rather conservative but stable demand - as long as snow falls and grass grows, these equipments will be needed.

Most of the sales goes to the domestic market, though export is growing, especially to Romania and Poland. A part of the buyers are users, mostly institutional actors (city managements, motorway managements), but – especially on the export market – they supply to larger manufacturers as well. They build mostly on stable relationships with larger partners, often supporting them in their capacity shortage problems. As they say: we are too small to be known in the European production scene, so our chance is to tie our little boat to these larger ships". The company also aims to keep its customer pool diverse.

In terms of suppliers, certain standard elements – such as hydraulics, certain electronic solutions – they procure from the global market, just as their competitors do.

The company moderately invests both into product development (4-6 persons FTE dedicated to that) and innovation in production as well, introducing Industry 4.0 technologies. One of the main aims is to standardise and monitor all company functions and processes, to lessen their dependence on individuals and to reduce the chances for human error.

They operate a separate R&D&I documentation system and apply for various research and technology development grants as well. They also have tried to run though a patent application but costs in finances and time were too high so they gave up without finalising it.

Their market advantage is still being relatively low-cost in production but producing a quality that meets the "Western" requirements.

A significant challenge seems to have been handled well: the generational change on behalf of the leadership – the son of one of the directors is studying mechatronics and prepares for the upcoming responsibilities. Apart from him, the staff of the company also comprises many younger colleagues, eager to work and prove themselves. The enterprise also runs internal trainings and offers development opportunities for the staff.

One area where they want to further develop is change management, to be better adapted to continuously changing environments.

An important guiding principle for the company is to keep frugal, not to overspend, rather to keep building by smaller steps.

4.2. Case study #2

Company C2 - Robust

The company C2 is at least 5 companies in one – they operate in sports equipment and accessories trade but also in organising, managing and communicating various sport and other events, innovating in sport technologies and matchmaking sponsors with athletes and sportspeople. Standing on more than one feet allows them to create stable growth for the company and its employees.

They operate in Central Transdanubia and started their activities almost three decades ago. They started out organising sport events, also working in their communication and sponsor management tasks. Today, they organise -for several different sports – international events, European and world cups and championships. They organise more than a 100 events per year, not only in sports but team-buildings, large parties and festivities, economic or health-related gatherings, conferences and family days, let those be in-house or open-air. This allows for a wide range of activities, with a portfolio that is less sensitive to individual shocks.

In sports technologies they aim at introducing the innovative solutions and technologies into the everydays of sport. Their market advantage is being broad-scaled in terms of sports, covering the special needs of painting for various sports fields to the tiny details of best ways of operating changing rooms for different sport types.

They mostly but not solely cater domestic actors. The company has a rather large list of satisfied and regular customers which they are happy to share on their website. Caring for partners' special needs and yields a lot of word-of-mouth marketing, happy customers advising their services to further potential buyers.

4.3. Case study #3

Company C3 - Robust

The company was founded in 1990 by a group of engineers working in the telecommunication sector. They produce GSM and telecommunication equipment, audio and video signal transferring equipment, IP technology-based apparatus, surveillance technologies, microwave machinery – final products as well as parts of them.

Apart from the product line targeted for the wide public, they also operate in a specialised niche market, as an audited military supplier, producing uniquely designed and developed equipment (microwave apparatus, accessories and software) for military purposes. The technologies developed and used by the company can be used for civil just as well for military users, offering a high quality on both fronts.

The company started out as a domestic actor but has grown into exporting its products as well. A large chunk of the production is represented by various alarm and surveillance technologies, protecting from afar public and private estates, warehouses, base stations etc. The system is built on a standardised but modular principle, allowing for any combination of the different movement/temperature etc. sensors and the IT system needed to serve them.

The company owners are dedicated to further product development and innovation, investing into their very own R&D team, but also think ahead in terms of continuous modernisation of the production itself with applying Industry 4.0 technologies and trying to meet client's expectations in high quality products and services.

4.4. Case study #4

Company C4 - Resilient

The company operates in Western Transdanubia and employs around 25 people. It was founded in 2003, building heavily on the special expertise and knowledge of the founder. They manufacture various metal structures mainly for the construction industry and the agriculture sector. In addition, various metal gates and fences are offered. Finally, they create special hand-crafted items such as climbing walls and wrought-iron products.

They supply to very different sectors, besides construction and agriculture, they are also part of the supply chain for the automotive industry. This offers them a good portfolio of clients in a balanced equilibrium, independent of sectoral highs and lows.

The company continuously invests into modernisation of production equipment. Though Industry 4.0 technologies are somewhat limited in manufacturing unique and individual products, the R&D and innovation invested into designing more modular systems for large metal structures eases this pressure and leads towards standardised and well-monitored processes in manufacturing.

The developments and investments made in the last decade allowed for a wider palette of services, and a faster speed of production. They also increased their market share and recognition. The company aims to further invest into development and modernisation.

4.5. Case study #5

Company C5 - Resilient

The company was set up in 1990 and is 100% in Hungarian private ownership. They specialise in traffic lights design, production, servicing. With the products of their own design, they are a key market actor on the domestic market.

In the past decades, they kept on widening their activities and specialities. Currently they not only produce the equipment but also design, build, monitor and service full traffic hubs if needed. They invested into building both the staff and the machinery to provide full service from design and planning to the technical handover. The company also takes on the design and construction of public lighting networks as well.

Due to the nature of the sector, the clients are mostly public actors or state owned companies. They also operate outside of Hungary, in the neighbouring countries.

The company has invested into their own product developments, most importantly they not only produce traffic lights but also provide a distant-monitoring electronic system to the lights themselves. This innovation allows them to offer their products at the technological level of the 21st century and enjoy the satisfaction of their regular customers.

4.6. Case study #6

Company C6 - Resilient

The C6 company was founded in 1993 in Northern Hungary and it is 100% Hungarian-owned. Originally the main activities focused at business consulting but step by step they moved toward textile production – in a period when the textile industry was in complete downfall throughout Central and Eastern Europe, due to heavy competition in the cheap labour segment from Turkey, China and other Eastern actors. The trick is that they operate in military textiles and equipment – they manufacture different bulletproof

wests, mainly as suppliers for German B2B buyers. Their products are sold then by the German partner to British, German and North-European clients, mainly for the military, for the police and for security companies. Besides, they have supplied Hungarian clients as well throughout the last two and a half decades.

The company has all the necessary licences for military production – which is due to the high quality ensured by the owners and core team, equipped with significant engineering skills, expertise and knowledge.

The company also made sure that they invest into building/buying the necessary machinery for the full palette of the production from tailoring to sewing, from finishing to packaging. Since the machinery is there, they also produce non-military but heavy-textile products such as sheets, tarpaulins and tents. They are capable of manufacturing waterproof sewing, therefore the usability of their products is almost endless.

They pay attention to their labour force, the production team is rather stable and loyal. Due to being close to the Slovakian border, they also employ Slovakian citizens. Furthermore, they have a solid and stable network of suppliers and partners whom they can mobilize in case of a peek period with contracts over their own capacities.

4.7. Case study #7

C7 – Antifragile

The legal predecessor of the company, operating on the Great Plains of Hungary, was founded in 1958, as a state-owned company offering machinery and equipment for the agriculture. In the 70s they started exporting – though within the COMECON system (a socialist trade and production allocation system applied to the Eastern Bloc). In 1993 the company was privatized (and some parts of it are in employee's ownership). Today it employs around 120 people.

The company is very well embedded into the local environment. It is a significant employer in the district and in the county, and regularly takes part in local life, sponsors local events and looks out for employee wellness. The factory location is inherited from the old times but inside the oldish buildings equipment and technology is modernized.

The product range is very wide, but includes various grain technology systems and machinery units (cleaners, dryers, crop storage silos and related material handling machines, steel structure superstructures), livestock-related machinery (roughage pick-up universal adapters, grain filling and foil filling, silage-foil filling machine, manure-fermentation equipment) and soil machinery (stone pickers, root cutters).

Within the wide production range, there are several old classic and standard equipment and machinery but modern and innovative items are also developed and offered. Most importantly, biomass boilers and heat exchangers are marketed as tools for the green economy. The company also carries out significant innovation activities in the field of agricultural machinery industry, based on the professional knowledge and experience accumulated over several decades. In addition to production, they hope to meet the needs of agricultural entrepreneurs by applying modern technical solutions.

The company also offers various services (mostly: installment, monitoring and servicing) for its more complex products. This is conducted together with local trainings for the client's staff if needed.

Importantly, while the company has successfully entered export markets in the West as well, many of the socialist-era connections are still in place, today mostly among private companies but building on long decades of working together.

4.8. Case study #8

C8 – Anti-fragile

The company is located in North-Eastern Hungary, at the Great Plains. It was founded in 1991 and manufactures machinery and equipment for cooling, refrigerating, freezing and air conditioning. They primarily carry out the design, construction, repair, maintenance of industrial-scale cold stores, cold rooms, regulated air (ULO) vegetable and fruit containers, milk, meat, etc. refrigerators, quick freezers, other cooling systems, as well as leakage inspections.

They are applying decades-long expertise and knowledge while at the same time invest into innovation and developing new products.

The enterprise is targeting both external and domestic markets with its products, mostly as solid and regular suppliers of larger manufacturers. They invest a lot into these partnerships and also aim to broaden the circle, in order to achieve an even higher level of independence by building a more wide-spread portfolio of clients. They applied several different audit and quality management systems in order to meet the expectations of Western clients as well.

The company values their employee network as well, and tries to keep fluctuation rates low. They offer various motivation and support schemes as well as continuous training opportunities for the staff, to keep them loyal and at the same time to increase skills and knowledge within the company.

4.9. Case study #9

C9 – Anti-fragile

The company was founded in 1990 and its main profile is designing and manufacturing machinery and equipment for the food sector, namely for meat processing (within that they focus at poultry but also offer products for the red meat processing segment). It is located in South Transdanubia, close to a large urban center. The company is 100% Hungarian private-owned since its foundations to this day.

Currently approximately 50 people are working at the enterprise. Besides the manufacturing, they also take on the installation and servicing tasks regarding the machinery they produce. Furthermore, they also use their machinery in practice, having poultry meat processed at their factory. This allows for them to test their design and products in real business, real life.

In its own segment of manufacturing poultry meat processing machinery, the company is a market leader on the domestic market, always keeping in sight the needs and specifications of its clients. The machinery and equipment meet the relevant EU and international requirements and legislation in terms of food processing and hygiene. The machinery is also designed to be operated in a cost- effective way. The company has a significant level of experience in his experience in the processing of stainless materials which enables them to deliver high-quality, economically available products to other areas of the food industry and comply with the strict hygiene standards of the HACCP system.

They, similarly to the other evaluated companies, invested heavily into Industry 4.0 technologies, introduced recently a brand-new ERP system and installed several new, smart metal processing machines.

Currently the company works at increasing its design and innovation capacity in order to take one step further and offer the design and realisation of full processing facilities. This will give them the advantage needed to increase their domestic sales but also to be more successful on the export markets as well. In order to conquer the export markets, they take part of various international exhibitions and expos from Germany, Cologne to Russia, Moscow with a unique stand.

One of the main assets of the company is their internal know-how and tacit knowledge, which, together with employee loyalty, composes the main basis for their success. The core management team (head of technical design, head of engineering, etc.) works at the company since the foundation. The staff is very loyal and recruiting selection procedure is very meticulous. The satisfaction of not only the clients but both the owners as well as the employees is of key importance.

4.10. Case study #10

C10 – Controll

The company was established in 2004 by its CEO, who is leading the company today together with his two sons, having successfully arranged for the generational change. The company is located in Western Transdanubia, and it started as a greenfield investment. The 2000s were characterised by getting new markets and subcontracted manufacturing work for larger Western European producers. Further into the decade they developed their own products and started selling those first on the domestic, later on the export market.

Today they export to three continents, 15 countries. They offer matrices, bedroom furniture and accessories. Their product line is competing on the higher quality, hand-made segment, as there are large Eastern producers with automatised, mass production capacities flooding the markets with cheap merchandise. The C10 company offers its products to the public through specialised stores but they also serve large buyers directly (such as hotels, etc.).

C10 also aims to introduce Industry 4.0 technologies wherever appropriate, they have recently invested into a significant new production line and into a new ERP system as well. Hand-made craft technologies are still part of the value added, though.

The company also looks into the future by investing into related R&D, mostly into the embedding of user friendly sensor-based technologies into furniture. Their company motto is to always have at least one flagship product, one that can be presented at market fairs, exhibitions and that will bring in buyers for the rest of the stock as well.

Furthermore, C10 pays attention to the use of environment-friendly materials and green production technologies, reducing and recycling waste and being audited to certain green labels. This opens up the higher-end segment, both in terms of Western buyers but also those more prosperous domestic or Eastern clients that are willing to pay for the green value added.

The company also invested into its sales solutions, having contracted sales agents in certain Western EU countries with significant hotel chains. They also try to build a reliable importer network in most of the countries they want to export to, since knowledge of local connections, habit, cultural background is of paramount importance for increasing export sales.

4.11. Case study #11

C11 – Controll

The company, located in Central Transdanubia, employs around 200 people and operates now for more than two decades. The company started out as a classic “garage” start-up, using in fact one of the founders’ actual garage as the first workshop for production. The first two years were only about investments, the first significant contract was signed only after that.

They had to face various technological, financial and management challenges before they started to accelerate due to the heavy investments into innovation and technology. The 2008-09 financial and economic crisis was hard on this company as well, but they managed to overcome the hardships.

They are present on the global market and offer individual machinery. They are also competitive in laser- and plasma technologies as well. The company is active in its sector and among Industry 4.0 sensitive enterprises. It is one of the founding partners of the Hungarian Industry 4.0 platform.

A significant step in the history of the firm was the transformation into a holding type of enterprise group. This was necessary to cut their dependence on certain suppliers by building out their own supplier basis. This allows for more accountability, higher quality and security in supplies.

A key asset of the company is its human resource, employee loyalty is highly valued and the company tries to keep its trained labour force by all means. The company also offers continuous training opportunities for its staff.

4.12. Case study #12

C12 – Controll

The company C12 started out as a family-owned, family-operated small metal cutting workshop in 1996. It is located in the Great Plains of Hungary. Until the 2000s, the company invested mostly into setting up the proper factory location and acquiring the necessary machinery and tools. Today it employs more than 140 people and has a solid reputation as a company with practical knowledge and skills as well as R&D and innovation output. They have received several different awards and prizes for outstanding quality.

They produce parts for several different industries, offering them a larger independence from individual sectoral demand changes. They manufacture electric motor shafts to the household appliances and hand tools industry, various shafts and parts to the automotive sector, and further types of components to the medical technologies and furniture industry.

The company has invested into the most appropriate and precise machinery needed. They have realised that in this segment of industry, the most important aspect of a product (small components) is precise size, not a micron more or less. Therefore, the machinery installed is targeted to provide for that punctuality. They have acquired a significant machinery park by themselves but also took the opportunity to take part in EU-funded projects to enlarge and modernise their technology.

They are very active not only in keeping and training their own labour force, but they are part of the so-called dual training system, being a local training factory for young people who also still study in a classroom-setting (hence the dual nature of the education). Being a training facility requires time and effort on the company's behalf (their best experts spending time with teaching, young yet-untrained personnel with a bit of fluctuation coming and going, etc.) but this investment get justified by the excellent colleagues that the best pupils become.

5. Summary

In this chapter we summarise the lessons learnt from the case studies. A common feature of all the examined companies is that they were founded in the 90s or early 2000s, none of them was established later. These companies have by now a lot of institutional experiences and tacit knowledge, very likely to push them towards the more resilient character.

This selection is biased due to the fact that the initial picking scheme for the companies took into account their economic performance over the years and the longer the timeframe for evaluation, the more data the analysis had to be taken into account.

Going through the case studies, we aimed to identify the most relevant potential factors behind resilience. We have found the following patterns:

Robust

- Serves a rather conservative but stable demand
- The company also aims to keep its customer pool diverse.
- Invests into product development
- Introducing Industry 4.0 technologies
- To standardise and monitor all company functions and processes, to lessen their dependence on individuals and to reduce the chances for human error.
- Having the market advantage is still being relatively low-cost in production but producing a quality that meets the “Western” requirements.
- Successful generational change on behalf of the leadership –
- The enterprise runs internal trainings and offers development opportunities for the staff.
- Initiate trainings and mentoring in change management, to be better adapted to continuously changing environments.
- To keep building by smaller steps.
- Standing on more than one foot allows them to create stable growth for the company and its employees.
- Having diverse clients, having a portfolio that is less sensitive to individual shocks.
- Having the market advantage of being broad-scaled
- Happy customers yield a lot of word-of-mouth marketing,
- Operating in a specialised niche market
- The system is built on a standardised but modular principle,
- investing into their very own R&D team, applying Industry 4.0 technologies

Resilient

- To supply to very different sectors
- Having a good portfolio of clients in a balanced equilibrium, independent of sectoral highs and lows
- Designing more modular systems
- Offering a wider palette of services
- Operating in a specific segment, with products of their own design
- Widening activities and specialities

- Clients are mostly public actors or state owned companies
- Invest into their own product developments
- Operating in a special (military) segment,
- Have all the necessary licences for military production
- Being equipped with significant engineering skills, expertise and knowledge
- Having the necessary machinery for the full palette of the production
- Paying attention to their labour force
- Have a solid and stable network of suppliers and partners whom they can mobilize in case of a peek period

Antifragile

- Being well embedded into the local environment
- Modern and innovative items are also developed and offered
- Offers various services
- While the company has successfully entered export markets in the West, those old connections are still in place
- Applying decades-long expertise and knowledge while at the same time invest into innovation
- Building a more wide-spread portfolio of clients
- Offers various motivation and support schemes as well as continuous training opportunities for the staff
- Testing their design and products in real business, real life
- Products meeting the relevant EU and international requirements and legislation
- Designing economically available products
- Invest heavily into Industry 4.0 technologies
- Increasing its design and innovation capacity
- To take part of various international exhibitions
- Having internal know-how and tacit knowledge
- The staff is very loyal and recruiting selection procedure is very meticulous

Control group

- Having successfully arranged for the generational change
- Developed their own products
- Their product line is competing on the higher quality, hand-made segment
- To introduce Industry 4.0 technologies
- Always have at least one flagship product
- Being audited to certain green labels
- Build a reliable importer network
- Industry 4.0 sensitive enterprises
- Embedded into local professional network: being a founding partners of the Hungarian Industry 4.0 platform
- Set up a holding, an enterprise group to cut their dependence on certain suppliers by building out their own supplier basis

- A key asset of the company is its human resource
- Continuous training opportunities for its staff
- Practical knowledge and skills as well as R&D and innovation output
- They produce parts for several different industries
- The company has invested into the most appropriate and precise machinery needed
- Being a local training factory for young people

Taking a good look at the analysis above, we can see that the potential traits of resilience are definitively identified in many of these companies. Interestingly – and also partly due to a selection bias – these companies are more of the "oak" types, the old, traditional ones, who have been through a lot and gained a lot of expertise during the decades.

Clear factors behind success are:

- Successful management of generational change if necessary
- Investing into R&D and innovation, developing their own products portfolio
- Investing into Industry 4.0 technologies (which, on the one hand, offer speed and preciseness in production but also force companies to standardise the production process, making it less prone to human error and less dependent on individual tacit knowledge)
- Investing into staff: organising trainings, watching out for employee needs
- Being embedded into local networking, let those be professional or civil society

In addition to these above, we have found that more than one of the companies operate in a special niches segment with a high share of public institutional buyers. These segments are: the military and the public transport.

Interestingly, we could not confirm the different patterns in case of the control group. What we can suppose at the moment is that individual luck still plays a role in certain companies being resilient or not, as all factors cannot be controlled by all means.

Also, the development of both the quantitative and the qualitative methodology for analysis, sampling and questioning (setting up a more detailed interview structure) will help to better identify the nuances making the difference for resilience.

Finally, the analysis has to be prepared for not being able to well characterise the control group's underlying factors, mostly because for that we have to better see reasons of failure that are usually not easily admitted even in an anonym interview setting. Therefore, there are significant obstacles to learn more about the factors that led to non-resilient behaviour and use those as control factors when identifying the resilient companies.

It is advised for the further steps of analysis and research into resilience to work on the enhancement of the quantitative selection procedure as well as to elaborate a detailed methodology, interview panel and questionnaire for qualitative analysis of various resilient form behaviours.

6. Annex – Not to be circulated publicly

The companies included in the current analysis:

Number (indicated in the analysis)	*Tax number*	*Company name*	*Group*	*WP T1 involvement*
C1	11011578-2-02	HIDROT Ipari Gyártó-, Kereskedelmi és Szolgáltató Korlátolt Felelősségű Társaság	Robust	YES
C2	10473146-2-19	Pannonsport Kft	Robust	NO
C3	10345948-2-42	TELETECHNIKA Engineering Műszaki Fejlesztõ Kft-	Robust	NO
C4	13063399-2-18	Török Fémipari és Kereskedelmi Kft	Resilient	YES
C5	10340857-2-09	Zöldfény Lámpatelepitő és Szerviz Korlátolt Felelősségü Társaság	Resilient	NO
C6	11202976-2-12	An-Ro Ruha Kft	Resilient	NO
C7	11163163-2-10	HEVESGÉP Mezőgazdasági Gépgyártó, Szolgáltató és Kereskedelmi Kft.	Antifragile	YES
C8	11766106-2-09	HUNYADI MŰVEK 2000 Hűtő- és Klímatechnikai, Kereskedelmi és Szolgáltató Korlátolt Felelősségű Társaság	Antifragile	NO
C9	10338045-2-02	SAMPO Élelmiszeripari Gépgyártó Korlátolt Felelősségű Társaság	Antifragile	NO
C10	11131841-2-08	Biotextima Kft.	Control	YES
C11	11875620-2-19	VESZ-MONT '2000 Szereléstechnikai és Gépipari Korlátolt Felelősségű Társaság	Control	YES
C12	11391849-4-16	UniTurn Fémipari Korlátolt felelősségű társaság	Control	YES