RESILIENT LOCAL MANUFACTURING IN SJUHÄRAD- A DELPHI STUDY TO IDENTIFY ENABLERS AND CHALLENGES

Sara Harper, PhD (1) and Rudrajeet Pal, PhD (1,2)

1- Faculty of Textiles, Engineering and Business, University of Borås, Sweden

2- Faculty of Engineering and Sustainable Development, University of Gävle, Sweden

August 2023

Sparbanksstiftelsen Sjuhärad

THE SWEDISH SCHOOL OF TEXTILES
UNIVERSITY OF BORÅS

Key insights (Executive summary)

This **report** details a **Delphi study** undertaken within the ongoing research project “Resilient supply chains for local textile and clothing production in small series” with funding from Sparbanksstiftelsen Sjuhärad-No.20221947. More information about this project can be found **here**.

Specifically, this report summarizes the results of a Delphi study-designed to capture the level of agreement among practitioners operating within the Sjuhärad region in Western Sweden regarding the **enablers and challenges** of **resilience within local textile and apparel manufacturing supply chains**. These results are based on the perceptions of representatives from diverse companies that have had experience with local manufacturing and/or sourcing, which undertake activities within one or more value chain stages (**textile manufacturing**; **garment manufacturing**; **retail**). The two main steps of the Delphi study were, first to identify issues that are **enablers and/or challenges**-relevant to at least two companies within an interview round, and then to evaluate those issues using an online questionnaire to analyze and visualize levels of agreement.

A key argument of the study and larger research project is that both localization opportunities and challenges are significant within the textile and apparel industry, due to having high risk exposure with complex global supply chain structures. So, there is a need to understand the complexity of such location decisions in this context, including associated trade-offs for resilience. On one hand, localization can lead to enhanced flexibility, responsiveness, and customization due to reduced complexity and shorter supply chain distances, but on the other hand local supply chains can reduce adaptability related to global network structures and can be challenged by cost trade-offs. To understand this complexity, the supply network configuration approach can be helpful-to show structures that underpin resilience. By addressing the supporting structures and capabilities required for resilience, this report can **support development** of more resilient supply chains by highlighting **what is required for improved resilience outcomes** (Competitiveness; Growth; Reduced risk exposure; Reduced recovery time) and **what challenges must be overcome**.

The key results of the Delphi study show **moderate levels of resilience** in the context, which is **supported by several enablers**, which can be ***challenging*** with insufficient levels. Agreement is found with enablers related to:

-Capabilities and performance priorities (**situational awareness**; **quality**; **delivery/short lead times**; **sustainability**)
-Processes (**flexibility and agility**; ***competence***)
-Relationships (**close and long-term relationships**; **transparency and communication**)

The only two challenges with high levels of agreement are ***competence*** limitations and high ***costs***/cost trade-offs. However, the lack of both strong opinions and high levels of agreement about resilience indicates opportunities for improvement. The suggested need for managers to have strong **situational awareness** can be a key area to develop.

In contrast, there were more mixed opinions found among respondents about other enablers/challenges, including *location* as either an enabler or challenge for resilience, and challenges related to exposure to *external risks/disruptions*. This suggests diverse experiences related to localization in a context of increasing external challenges. Additionally, the lack of strong opinions about digital tools/automation as an enabler suggests additional development is required, although several respondents emphasize significant recent investments as crucial. The lack of strong agreement about product-related enablers/challenges suggests different perspectives on small-series production, although the majority of respondents consider focusing on small volume, high value products to be more an enabler of resilience than a challenge. Overall, these findings indicate that managers must carefully consider localization with respect to cost trade-offs, limited industry know-how and varying levels of exposure to other challenges in high-cost contexts.

Looking forward, such insights related to enablers/challenges of resilience should be taken into consideration within decision-making processes-that define supply network configuration (products, processes, relationships, supply chain structures), with respect to **implementation and scaling goals**. Notably, the findings suggest companies are likely to need to **invest in competence development**, including process and technology-related skills, as well as sensing skills (awareness). However, careful consideration of cost trade-offs is required within such decision-making processes, which should be addressed throughout the supply chain from the perspective of actors with control over supply chains. **Such decision-making considerations will be addressed in the following report within this research project.**

Report overview

This report details a Delphi study addressing the increasingly important topic of **enablers and challenges** of **resilience within local textile and apparel manufacturing supply chains**. The study was the first stage in the research project "Resilient supply chains for local textile and clothing production in small series" with funding from Sparbanksstiftelsen Sjuhärad. The study focused on understanding the perceptions of practitioners operating within the Sjuhärad region in Western Sweden and included diverse companies that have had experience with local manufacturing and/or sourcing.

The goal of a Delphi study is to understand the level of agreement among respondents that have a wide variety of views on the topic. This Delphi study was undertaken in two main steps. In the first step, 13 companies (14 respondents) were interviewed. Thereafter, issues addressed by at least two companies were included in an online questionnaire. In the second step, a total of 12 respondents from 11 companies evaluated these enablers or challenges from green to red based on their level of agreement with each statement.

Overall, the findings show **resilience is considered moderately high locally**, although strong agreement was not found, and no respondents had strong feelings about having a high level of (company/supply chain) resilience. This highlights the need for improvements and development regarding resilience in order to handle internal and external challenges.

One key area of development suggested by the findings is **situational awareness**, as this was a **capability** that was evaluated to be an important enabler. Despite this importance, only few companies specifically discussed it during the interview round. This may mean that such abilities are latent, which requires greater awareness of the abilities, or this could mean there is a need for further development of required sensing skills.

Several **performance goal-related priorities** found to be crucial for enabling resilience were **quality**, **delivery**/ short lead times, and **sustainability**. These are requirements for competitiveness in high-cost locations like Sweden and have been highlighted in previous studies in the Sjuhärad region in particular.

Beyond those enablers, several others were found to be crucial, most notably **process** flexibility and agility, and competence to support other enablers, as well as **relationship** priorities including having close relationships as well as high levels of transparency and communication in the supply chain. Several of these key enablers are explained to be crucial for both **proactive and reactive resilience**, specifically:

- **Flexibility and agility** was found to have 100% agreement and was described as benefiting both proactive and reactive resilience capabilities through supporting high product variety for both competitiveness and for the ability to respond to challenges and opportunities-like working with locally available materials.
- **Competence** also showed 100% agreement, which is supportive of the required process flexibility and agility, situational awareness, etc.
- **Close and long-term relationships** were also highly agreed upon as crucial, which support both readiness and abilities to manage disruptions.

Regarding challenges, there was high levels of agreement about only two issues, specifically:

- **Cost trade-offs** with local manufacturing/supply.
- **Competence limitations** that are both explicit-restricting capacity and growth and implicit-less awareness about sensing skill requirements.

In contrast, there were more mixed opinions regarding product and supply chain enablers, as well as corresponding challenges, which suggest complex influences. Additionally, **digital processes/ tools and other (automation) technologies** were considered important by the majority of respondents, but without strong agreement, and some stressing limitations.

Likewise, several challenges show different levels, in particular, the mixed exposure to **external risks** (and logistics delays) suggests both readiness in local supply chains, and corresponding opportunities related to localization with increasing disruptions.

The findings of the Delphi study suggest several insights for **decision-making** and i**mplementation**; however, differences among company types must be considered-to reflect the different levels of control over manufacturing and supply chains. In other words, to achieve the goal of scaling local textile and apparel manufacturing it is important to distinguish and align the perspectives of producers and brands-which have a key role by having both the power to design supply chains but also face challenges with changing business models. Such implementation and scaling issues are in focus within the following study.

Acknowledgements

This report is published within the scope of the project “Resilient supply chains for local textile and clothing production in small series” with funding by Sparbanksstiftelsen Sjuhärad-No. 20221947

Citation: Harper, S. and Pal, R. (2023) Resilient local manufacturing in Sjuhärad-A Delphi Study to identify enablers and challenges, ISBN 978-91-89833-22-7

Sparbanksstiftelsen Sjuhärad

THE SWEDISH SCHOOL OF TEXTILES
UNIVERSITY OF BORÅS

The data in this report was generated in collaboration with several respondents from companies operating in the Sjuhärad region, which are acknowledged for their involvement.

These include: FOV (Borås), Gina Tricot (Borås), Syverket (Borås), TEXTILFABRIKEN (Borås), Tobex (Borås), XV Production (Borås), Hobby Reklam (Gällstad), Seger (Gällstad), Ekelund (Horred), Ludvig Svensson (Kinna), Marbäck Tricot (Marbäck), among others.

Note: This report is written in English to support widespread accessibility of the findings, and to reflect the content of the interviews, which were undertaken primarily in the English language.

Contents

Introduction

Recently, there has been increasing interest in resilience-representing the ability to manage or cope with changes and challenges [1], and the possible benefits of local manufacturing or sourcing. While localization can lead to enhanced flexibility, responsiveness, and customization due to reduced complexity and shorter supply chain distances, this can also reduce adaptability related to global network structures [2] and be challenged by cost trade-offs. Thus, localization is a complex opportunity that requires balancing challenges and trade-offs with improved responsiveness to disruptions and changing customer demands within decision-making and reconfiguration activities.

Both localization opportunities and challenges are significant within the textile and apparel industry, due to extreme risk exposure with complex global supply chain structures. Within the industry, findings have shown 65% of managers are considering nearshoring to overcome supply chain challenges and respond better to shifting market demands while reducing inventory costs [3] and previously 71% of managers intended to relocate some production for reduced risk, improved responsiveness, and reduced overproduction [4]. The closely related topic of small-batch production is often highlighted with such planned reconfigurations and opportunities. However, such opportunities are still impacted by several conflicts and challenges. On one hand, there is a relative ease of relocation compared to other industries [5] but on the other hand, there are significant competence and technology limitations in high-cost countries. As with many sectors, the industry also faces high levels of uncertainty related to changes like rapid automation and digitalization.

Within this context, research is required to understand how resilience can be supported by increasingly local supply chains in textiles and apparel. This is the focus of the research project “Resilient supply chains for local textile and clothing production in small series” [6].

The overall project goals are:

- To understand factors for resilient local supply chains (and for small-series manufacturing) as well as challenges
- To explore decision-making and implementation of local/small-series manufacturing
- To assess the feasibility of small-series manufacturing opportunities (for resilience)

This report details the Delphi study within this research project that is related to the first goal. Following this research, further studies will focus specifically on: (i) configuration decision-making (product, process, supply chain, relationships), and (ii) providing a multi-dimensional analysis of feasibility of local supply chains, in general, and for small-series production models, in particular.

Study objectives and questions

In this report, a Delphi study is used to understand the potential benefits for resilience of localization of textile manufacturing/supply in high-cost contexts like Sweden. Specifically, the research addresses the following objective and associated research questions. The objective of the research is **to identify and understand important enablers and challenges of resilience** within local textile and apparel manufacturing supply chains. This is answered with two research questions:

- What **enablers** support resilience within local textile and apparel supply chains?
- What **challenges** resilience within local textile and apparel supply chains?

These questions are addressed within a specific high-context, the Sjuhärad region of Western Sweden, as industry- and location-specific insights are required to understand the challenges and opportunities related to localization. However, the findings can additionally offer some insights regarding similar industry and location contexts.

Key concepts

Supply chain resilience is defined as the ability to manage or cope with *"any change or new disruption to a system so that it can later return to its original condition or adapt to the new situation"* [1]. There are several aspects that can potentially support (i.e., **enablers**) or **challenge** supply chain resilience in the specific context. These can be categorized into dimensions broadly related to internal **structures** and **capabilities** (see the table below).

Specifically, **structures** supporting resilience can be understood using the concept of Supply network configuration, proposed by Srai and Gregory [7]. This allows for categorization of individual aspects related to: Supply chain structures, Relationships, Products, and Processes. **Capabilities** include the proactive and reactive abilities related to resilience [8,9], which are underpinned by structures/network configurations.

Resilience **outcomes** represent the success (e.g., competitiveness, growth) and survival (e.g., continued competitiveness, reduced risk exposure, reduced recovery time) in response to both **internal** and **external** challenges, risks and disruptions. In other words, the outcomes that should be maintained, returned to, or improved upon in response to changes or disruptions through high levels of supply resilience.

The main focus of the study detailed here is the part of the figure indicated in green-that includes factors (structure/capabilities/challenges), which have the potential to either enable or challenge supply chain resilience in the context. However, for understanding of how such factors are supportive and/or challenging resilience, additional attention is placed on experienced levels of resilience as well.

Resilience enablers	Resilience challenges	Resilience outcomes
Capabilities -Proactive capability (e.g., Flexibility/ agility, redundancy, integration, efficiency, market strength- including product differentiation, financial strength, readiness/ risk management) -Reactive capability (e.g., risk management/ response, recovery) **Supply network configuration** [Localization/ High-cost context] -**Processes** (e.g., flexibility, redundancy, efficiency, etc.) -**Relationships** (e.g., collaboration, trust, information sharing, etc.) -**Products** (e.g., customization, new products, etc.) -**Supply chain structures** (e.g., location, density, complexity, criticality, supply chain understanding, etc.)	**Context-Internal challenges** -Operational vulnerability (e.g., internal practices related to optimization, lean, policies, etc.) -Complexity (e.g., industry characteristics, globalization/ localization, outsourcing, supplier dependence, process interactions, etc.) **Context-External challenges** -Unexpected events (e.g., natural/ man-made disasters, demand rise/ fall, technology change, etc.)	*-Competitiveness (e.g., cost, quality, delivery, responsiveness, variety, etc.)* *-Growth* *-Reduced risk exposure (External/ Internal)* *-Reduced recovery time*

+/-

Supply chain resilience

Supply chain resilience

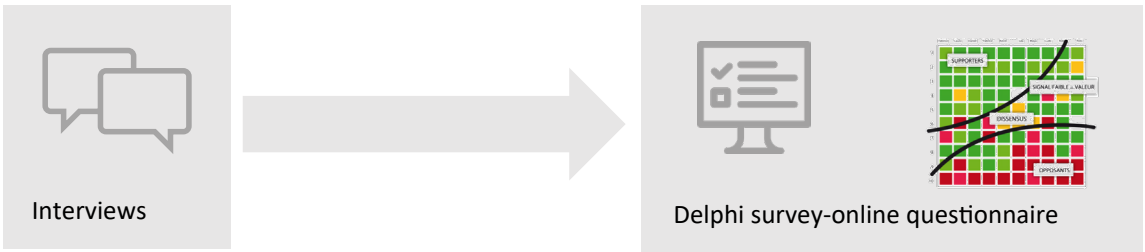
Adapted from Chowdhury and Quaddus [8]; Datta [9]; and Srai and Gregory [7]

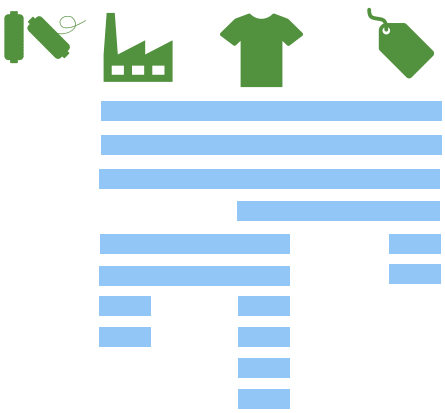
Methods and sample

This report details a **Delphi study**-a method designed to capture levels of agreement on a topic through multiple interview/survey rounds, here with two steps-focused on addressing the research questions and the associated issue of respondents' views on their resilience levels. Respondents were from companies in the Sjuhärad region, including manufacturers of textiles and/or apparel, as well as brands sourcing products locally in the region.

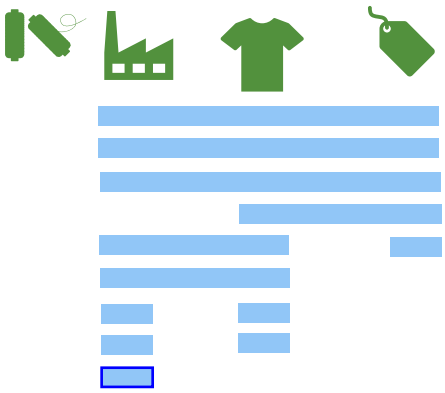
The sample was designed to cover different perspectives, with companies representing different value chain stages-textile manufacturing, garment manufacturing, retail (See figure below for visual summary).

- In the first step, **semi-structured interviews** were undertaken to ask about the enablers and challenges for resilience in the context, in line with the categories highlighted in key concepts.
- In the second step, the specific issues identified by at least two companies interviewed were included in an **online questionnaire** (to focus only on those relevant beyond a single company), using the tool Color Insight-as detailed below.





14 company respondents
(13 companies/interviews)



12 company respondents
(11 companies)
Note: Did not participate in interview round

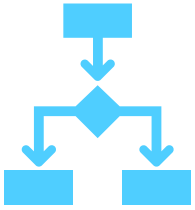
Note: The goal of a Delphi study is to understand the level of agreement among respondents that have a wide variety of views on a given topic. Here issues are evaluated by company respondents that represent various combinations of value chain stages-with some having control/ownership over textile manufacturing, garment manufacturing and retail stages (the longest blue boxes), textile and garment manufacturing together, or garment manufacturing and retail together (the blue boxes covering two value chain stages), or responsible for only a single value chain stage (the short blue boxes).

Color Insight tool (http://colorinsight.fr/)
- Strong agreement determined based on **80% agreement** (totally agree/agree) **[10]**
Note: White = I don't know **or N/A**

Overview of results

Resilience

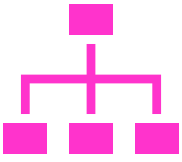
Capabilities and performance priorities (enablers/challenges)



Processes (enablers/challenges)

Relationships (enablers)

Products (no agreement)



Supply chain structures (no agreement)

External risk exposure (no agreement)

Resilience

The findings of the online questionnaire show that resilience is considered moderately high. However, as can be seen in the results visualized above-strong agreement (80%) was not reached, and no respondents had strong feelings (totally agree-dark green color) about their company/supply chain's resilience. Additionally, some respondents had mixed feelings (yellow color) about their current levels of resilience. These findings highlight there is need for improvements and development regarding resilience of local manufacturing/supply chains in order to better handle internal and external challenges.

Within the interviews, several company respondents stressed that structure/configuration-related enablers directly contributed to their ability to withstand and bounce back within the recent period of extreme disruptions. In particular, **relationships** enablers **close and long-term relationships** with supply chain partners was deemed to be of crucial importance. This was sometimes linked to the related enabler, **transparency and communication**, that was required at a higher level to manage disruptions. For instance, it was described that despite having long-term relationships with suppliers, more discussions about pricing, availability, etc. were required in response to external challenges.

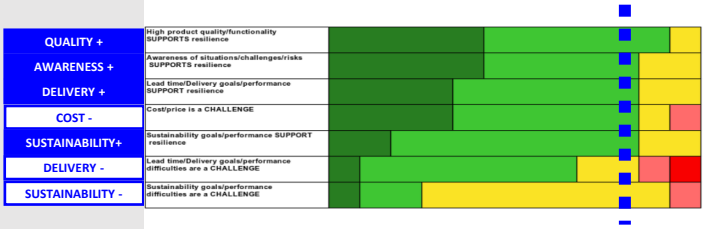
"we have developed long-term relationships with our suppliers, it was extremely helpful during the pandemic and the crisis, which actually made us come through the pandemic quite easy compared to other companies, I would say we managed to get priority and so on. So, we didn't have that bumpy of a road"
– Textile manufacturer

Beyond supply chain partnerships, several internal structures, performance priorities, and capabilities were highly ranked as enablers and explained to be crucial for enhancing levels of resilience. The highest agreement in the online questionnaire results (100%) was regarding **processes**, specifically regarding the importance of **flexibility and agility** and the underlying **competence** required. The flexibility that is demanded of manufacturers in high-cost countries was specifically described as being supportive of resilience in response to challenges by allowing for companies to offer new products quickly based on the availability of materials locally. This competence is closely linked to several performance priorities, as high levels of **quality**, **delivery** speed (short lead times) and **sustainability** (environmental/social) must be maintained with such flexible processes. Beyond process competence, it was also mentioned by some in the interview step that managerial competence for **situational awareness** was crucial to handle both expected and unexpected challenges, and this was highly evaluated in the online questionnaire.

"I think [us as managers] having this broader thinking and looking at the factors [risks and disruptions] that we have just discussed, being aware of them, has been extremely important to handle situations like these"
– Textile manufacturer

These and other resilience enabling effects will be discussed further in the following results sections, together with related challenges. While diverse challenges are mentioned, there was only agreement regarding cost trade-offs associated with local production and competence limitations in high-cost contexts .

Capabilities and performance priorities (enablers/challenges)



Enablers

Several performance priorities that are associated with local production and sourcing were considered important for product differentiation and thus market strength, which contributes to **proactive capabilities**. Specifically, agreement was found regarding the importance of **quality** (design, functionality), **delivery** (short lead times) and **sustainability** performance.

Quality performance was the most highly agreed upon goal, which was explained to be including diverse requirements for ensuring high product value while working with local or repurposed materials, and with products that have high design content and added environmental/ social value. For several respondents, this performance goal was the core focus of improving sustainability performance-by extending product lifespans. Ensuring high quality was described as crucial and benefitting from local manufacturing due to the relative ease of quality control with proximity and the competence available.

> **"we need to make sure that the local production has the same quality level as the global production, because the price will be higher to customers. So, customers will expect something that is better"**
> – Fashion brand

> **"[Many] micro factories do not work so much with upcycling and remake because it's more difficult (…) it is a strength for us that we have the focus on design and high quality (measurements, fit, etc.)"**
> – Manufacturer

Some respondents highlighted **delivery**/short lead times as the main performance goal with local manufacturing and sourcing.

> **"being close to the market makes it really fast. We can place orders late. The designers can wait to take the final decision (print, colors, etc.). And so that is really positive."**
> – Fashion brand

Other respondents mentioned such benefits together with **sustainability**, which was considered to be highly important, and was described as increasingly reducing exposure to cost challenges (e.g., through local and remake products/projects).

> **"[it is good that brands] can make smaller volumes and get started quite quickly. And we have short lead times. And that they want to work more sustainably, and they can come here to visit to see the production, to see the people behind the machines"**
> – Manufacturer

> **"We have always been the most expensive, sometimes that's been a little bit hard, but it gets better because people want the production close these days and they want to know exactly what happens with CSR and environmental things. So, the price issue is getting less problematic"**
> – Textile and garment manufacturer

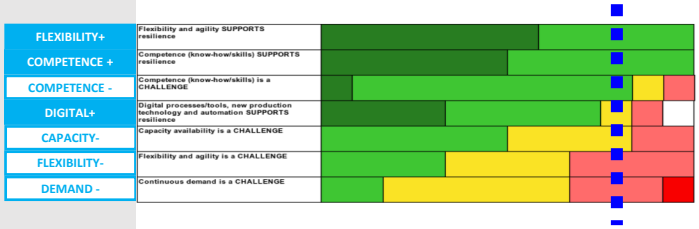
Beyond these performance requirements, high levels of agreement were found about the **situational awareness** capability. However, this was not widely discussed during the interviews-only mentioned by two companies. This suggests there is need to develop or emphasize such sensing capabilities.

Challenges

The only challenge with high levels of agreement was **costs**, which requires careful consideration of **trade-offs** with local manufacturing benefits. However conflicting views are suggested, with some respondents emphasizing lower product complexity and material costs and others stressing the benefits of focusing on higher value local materials. Also, some describe this as becoming less of an issue due to sustainability goals-as seen in the quote above.

> **"the costs are a lot higher locally. And one challenge is which type of products we actually place orders on. Now, the production running is for quite simple basic jersey products (…) not so much man-time is needed per product. That makes it easier for us to scale up"**
> – Fashion brand

Processes (enablers/challenges)



Enablers and challenges

Respondents were in complete agreement regarding the importance of process **flexibility and agility** and supporting **competence**, which were explained in interviews to be crucial for both **proactive and reactive capabilities**. However, competence is also one of the two challenges that was highly agreed upon. Less agreement was found regarding digital processes, and challenges like capacity and demand.

Flexibility in production and the ability to offer a wide variety of products was considered crucial to be competitive, thus supporting proactive resilience. Additionally, flexibility and agility was described as enabling creativity in response to new opportunities and challenges, like improving recovery with new products using locally available materials. However, there was less agreement about the challenges associated with such requirements, with some producers describing difficulties in optimizing processes for small volumes of unique products (e.g., remake), and problem solving in an ad hoc way, although none had strong feelings about such issues.

"we are very flexible in production, we make low quantities, we can help out with special sizes (…) if they run out of a size for example, we can make a super small production of just that size (…) It's not a problem"
– Textile and garment manufacturer

"once you're used a company like [us] I think you get a little bit spoiled with the flexibility and the quick response and low minimums (…) there's a lot of benefits, even if the price initially seems high"
– Textile and garment manufacturer

There was total agreement among respondents about the importance of **competence** (know-how and skills) to support current competitiveness and respond to challenges.

"I think that also makes a difference that they (employees) are willing to put in that extra work when it's needed, willing to be flexible, willing to help out (…) they do what is needed"
– Textile manufacturer

"we have found good people that are helpful and flexible, and they have the know-how, and we are working together as a team. And if we don't know how to make this solution, and what is the best way of doing this, someone else knows. So, we're finding out together."
– Manufacturer

There was also quite a high level of agreement about challenges related to competence limitations. Specifically, finding sewing operators was described as an ongoing barrier for growth and limiting capacity. Such production competence is both difficult to find and to develop.

"it's hard trying to find new people to learn, to find the right people for production (…) it's a major challenge, not only for us, but everyone that's in some type of production or manufacturing in Sweden"
– Textile and garment manufacturer

"quality is a challenge for us and to find the right workers (…) sometimes we are working with couture, or it could be quite difficult products. So, the knowledge of how to produce the garments, it takes a lot of experience (…) that's a challenge to grow our company"
– Manufacturer

"we have some capacity issues, because there are not so many people here locally with knowledge (…) [Still] we are looking into placing more orders and increasing"
– Fashion Brand

Competence challenges are also suggested with the importance of situational awareness contrasted with the limited respondents mentioning such capabilities as crucial in times of crisis (as previously discussed).

The findings showed less agreement regarding **digital processes/ tools and other (automation) technologies**; however, they were evaluated to be crucial by the majority of respondents. Several mentioned recent machine upgrading investments- Often with knowledge requirements. The lack of strong agreement suggests further development may be required for higher levels of resilience.

Relationships (enablers)

Enablers

The findings show very high levels of agreement about the importance of **close and long-term relationships** for resilience. As previously discussed, one manufacturing company that had established such relationships with their suppliers cited this as key for handling and recovering from disruptions, which distinguished them from other companies that were hit harder. However, there were mixed opinions about the challenges associated, wherein some product manufacturers find it difficult to develop partnerships to ensure consistent demand long-term, while others are developing such partnerships.

"[It is key] to work long term with our suppliers, it's not that we don't negotiate for prices, but we don't necessarily always look for the lowest cost at all. It's important for the supplier that it's interesting to do business with us, to keep them interested in the long run, for development and such"
– Textile manufacturer

"we have a bigger company that we are starting [on-demand production] with (…) they have bigger orders, so we will have a more fluid ordering and we can plan better in production (…) it will be a long-term agreement. So, it will be good for both"
– Manufacturer

Similar levels of agreement were found about the role of **transparency and communication** to enable resilience. This was described as crucial for both producers and brands, in some cases requiring development. For instance, one producer highlighted developments focused on managing communication and monitoring the supply chain to ensure that all required materials were available.

"we cannot just say that the customer should be responsible because that is not working, because we need to have something like a control station, to make sure that everything's here that we need. That is the kind of communication, and how the phase is working out. So, we are really making a lot of projects on that"
– Manufacturer

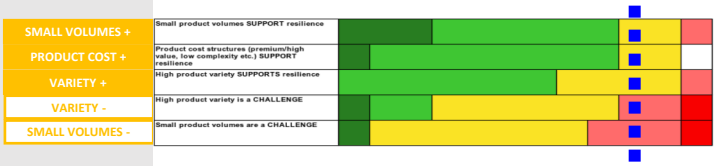
"all these collections we do here we communicate a lot more around production, we have open costing coming, for instance, and we have a map where you can see the coordinates of everything where it has been done. So, transparency. We talk more about it, even though we know the same transparency, for instance, in our other production countries, we talk more about it because we think it's a benefit that we can use for competitiveness"
– Fashion brand

Like with close relationships, mixed opinions were found regarding challenges associated with required communication. Certain companies mentioned struggles with complexity regarding sustainability value added, lacking internal resources, or managing levels of openness with customers, which required external partners and/or technology development.

"I think today, you need to convince customers to really change the way of buying a little bit, and these things takes a little bit of time. Even if it's normal, we offer standard sizes and that's no problem for the customers. It's just that it takes time (…) it's made by immigrants. And it's a little bit different. But it's fantastic qualities, we need to communicate the positive effects of these jeans. So, it's not it's not only jeans they buy it's actually the positive aspect of it for the for the community (…) we are going to start working with a communication bureau that can help us, because it's not for everybody. They (the jeans) are a little bit more expensive. So, we need to be more precise in the communication"
– Brand

"those are our [goals] to eliminate those (communication challenges), we need to use this technology in a much better way, getting rid of the human communication to some extent, having machines and systems communicating much more with each other. So that there cannot be any misunderstandings anymore (…) when you do that, productivity comes, and then profitability comes. So, like all of these things, they interrelate with each other"
– Textile manufacturer

Products (no agreement)



Mixed views on benefits (enablers) and challenges

Overall, there was a lack of high levels of agreement found regarding the importance of **high variety** and high value products. However, relatively higher levels of agreement were found regarding the importance of **small volumes** in production/sourcing and specific product **cost structures**-always premium quality, in some cases combined with low product complexity. For one brand, this focus on smaller volumes was mentioned with the overall target of producing less and better-quality products. Such small volumes are significant benefits of the crucial process enabler, flexibility and agility, but with seemingly lower impact on resilience. Nonetheless, these interrelated product characteristics are described as necessary for the product differentiation and market strength required to succeed within high-cost contexts.

"we have had good years, the past years, companies want to buy local (…) but you also have the companies that want to buy some kind of special product, maybe a certified product or something like that, that wants to buy it in small quantities. That's not possible in Asia (…) we have more to do than we can produce"
– Textile and garment manufacturer

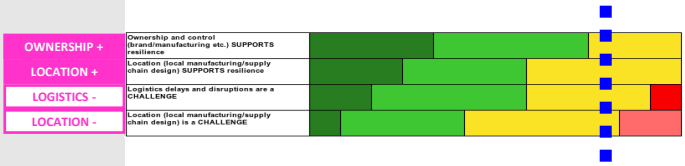
"we have since a couple of years back produced less, increased prices, increased quality and sustainable materials. So, we are on this journey. And I think we will sort of interlink, we will meet where the graphs connect, we will start making it possible for us (…) producing here, we now see it as a benefit and a good way of competing"
– Fashion brand

Despite mixed opinions, some respondents highlighted several crucial challenges associated with requirements for **high variety** and **small volumes**. Some of the more difficult issues were related to remake, material sourcing, or offering on-demand production; although, some of these manufacturers indicate improvements to these situations are in progress. For instance, one manufacturer was working to categorize products and processes for redesign and remanufacturing, whereas another was going to start a partnership with a larger company to enable on-demand production. However, the mixed opinions in the findings indicate that many companies are able to overcome these difficulties with their local set-ups, based on extremely flexible processes.

"I think that's our main and key issue, as long as we're doing subcontracting for other companies and we're doing just small batches mainly for quite new brands or small special products for an industrial company, the volumes are really small and that's why we don't get continuous production"
– Manufacturer

"even if we can be flexible, the fabric suppliers and the suppliers of accessories still have their minimums. So that's kind of a problem (…) I think [the local fabric deadstock supplier] is a good option. Customers can buy as small of volumes as like 50 meters, instead of 1000s of meters, if buying from a factory in Europe"
– Manufacturer

Supply chain structures (no agreement)



Mixed views on benefits (enablers) and challenges

There was a lack of agreement regarding the role of **location** to either enable or challenge resilience. Respondents described several benefits and opportunities associated with manufacturing and sourcing textile products locally, as well as various difficulties hindering scalability. Several specific challenges were related to costs and capacity or competence limitations (as previously discussed).

"companies want to buy local (…) they want to buy European production, fabrics knitted in Sweden"
– Textile and garment manufacturer

"many of these things (external challenges) are actually benefiting local production, I think. But it is very complex. And the supply chain is really complex. And what we believe, as a business strategy is that it is good to have a combination of both, but it is a challenge. And we know that many things impact how we place the orders and where we place them. So, looking at new suppliers, for instance, quality, sustainability, price, etc. are all important aspects that we need to look into before choosing"
– Fashion Brand

There were also mixed opinions-but a higher level of agreement was found regarding the importance of **ownership** and control to enable resilience. This level of control was considered crucial for both overcoming internal and external challenges and capitalizing on different opportunities emerging from a changing business environment.

"the internal complexities are challenging, but I think we will be able to cope with those, that's within our own control"
– Textile manufacturer

"we are one of the few textile suppliers that owns most of our production internally (…) that has helped us a lot.It's our own processes, we control the priority, we control the different steps in the supply chain"
– Textile manufacturer

Varied exposure to challenges

The findings highlight that some companies were significantly exposed to **logistics delays** during periods of high disruptions, although there was not high levels of agreement. This exposure required higher levels of (collaborative) problem-solving around these issues (e.g., related to communication- as previously discussed).

"one challenge that we had during COVID-19 was getting the material here (…) if we don't have the fabric or the products or the trims that we need, then it could be that we can't continue with the production (…) it could just be a small thread or a button that is stopping the whole production line. So, the consequences could be a really delayed deadline"
– Manufacturer

"we've been affected by logistic problems. And we have had delays, we have pricing freezes, just because some of the raw materials for our suppliers comes from somewhere else (…) [and] long lead times on investments (machines)"
– Textile manufacturer

"during the pandemic, the lead time of the transports and the lock downs were challenges to get things on time, and with increased of costs (…) it was several months that we couldn't get anything done (because of the war in Ukraine) (…) I would say that, at the beginning of the pandemic, it was easier for the customer to understand (…) the acceptance is not as high as it was a year ago"
– Garment manufacturer

External risk exposure (no agreement)

Varied levels of risk exposure

While several respondents considered **external disruptions** to be significantly challenging, strong agreement was not found, as some had more mixed feelings about their level of risk exposure. When respondents do experience more difficulties related to external disruptions, these were often lessened by established internal control and communication within close supply chain relationships that are required to compete in high-cost contexts.

"internal complexities are challenging, but I think we will be able to cope with those, that's within our own control. The dangerous ones are sort of the external factors (...) the world is becoming more and more unpredictable"
– Textile manufacturer

"I will not say that we didn't have impact, but I think in comparison we came out much better due to previous decisions that we were able to leverage on. But, I mean, of course, it has been a lot more discussions with suppliers, on pricing, on availability, on delivery times and so on"
– Textile manufacturer

The suggested mixed feelings can to some extent be explained by several respondents describing how they see that growing uncertainty and disruptions can be beneficial for local production. Additionally, some also mention changing legislation as potentially supporting local manufacturing or sourcing, or at least moving closer to the market, like with more nearshoring. However, there are various challenges stressed with changing and scaling business models (especially cost and capacity issues, as discussed).

"with the producer responsibility that will be coming in a couple of years, there will be a lot of textiles and garments here in Sweden locally. So, it will be really good to be able to use all of that fabric and textiles that is available. But that needs to be tested and see how that could be done in an efficient way, that is the challenge with all of these new business models, because to be able to do it, even though we want to do it from a sustainable perspective, we also need to motivate it financially because otherwise we will not survive (...) at the moment it is challenging, we can't reach the scale that we do in other countries"
– Fashion brand

Looking forward: Configuration decisions and decision-making

Configuration decision-making for resilience

The findings from the Delphi study detailed in this report highlight common resilience enablers and challenges among several diverse textile companies operating in the Sjuhärad region (as summarized in the figure below). However, to understand how such issues can relate to configuration decisions and associated decision-making processes it is crucial to distinguish among company types, to reflect the different scope of control had over manufacturing and supply chains. Broadly, to overcome various challenges revealed in the findings (both common cost/competence issues and other difficulties) that can get in the way of implementing and scaling local textile and apparel supply chains, collaboration is required to align the perspectives and requirements of producers, suppliers, and customer-facing brands.

Manufacturers

As a textile manufacturer, respondents describe more or less complete control over the fabric manufacturing stage, whereas the main scope of supply chain design is limited to material suppliers. While location is a consideration and can be a benefit, the limited or lack of available suppliers domestically means that European proximity may be the best or only option. In addition to targeting being an attractive customer for their suppliers, they must carefully position their products to be an attractive material supplier to customers, which was explained as a way to overcome cost challenges.

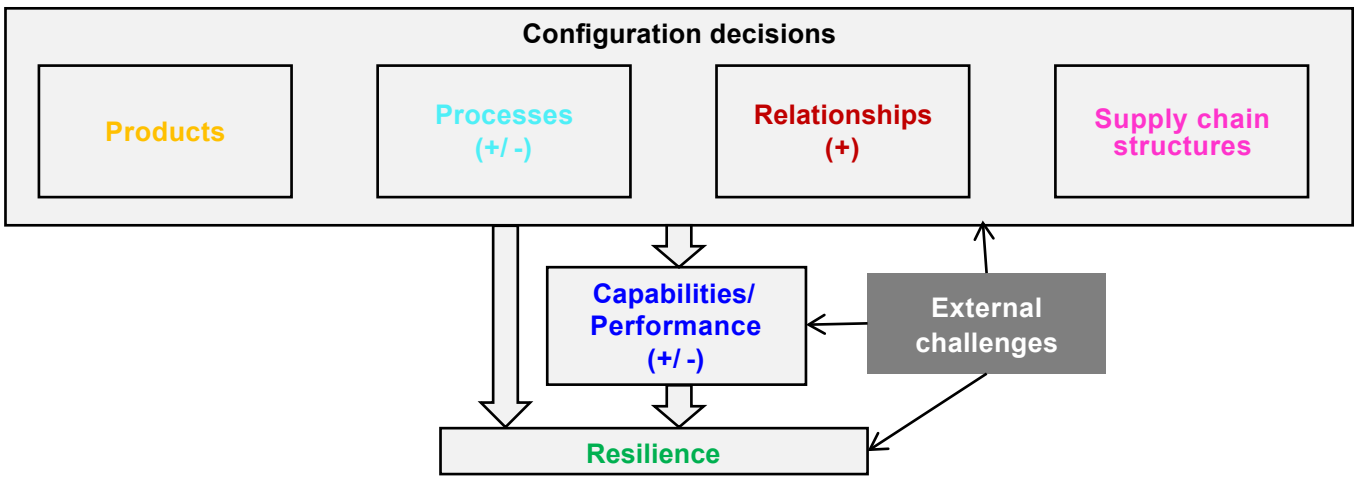
As an apparel manufacturer, there is generally only control over the product manufacturing stage; however, some are also vertically integrated fabric manufacturers-generally for knitted (jersey) products. In these cases, they face similar sourcing limitations based on location and specific requirements for differentiated products.

Brands

As mentioned, brands have the highest levels of control over supply chain designs. However, these actors are explained to be challenged by difficult transitions from traditional supply chains/business models to those based on local manufacturing (and potentially remake), with various scaling barriers.

Having greater control over manufacturing is why some producers have tried to (or want to) expand their business activities to include those for their own brands. Nonetheless, until such activities become a more significant part of their businesses, companies still have limited scope for designing supply chains. They instead have control over sourcing fabric based on availability. Sourcing regionally available leftover materials (deadstock) is considered a very good option, as sourcing sustainable fabric from mills in Europe often involves high minimum order quantities.

These and other issues related to configuration decision-making for resilience will be addressed further in the following study within the project and detailed in a corresponding report.



Further reading

This report offers an executive summary of and extends a corresponding research paper. More details of the scientific work associated can be obtained upon request from the lead author*.

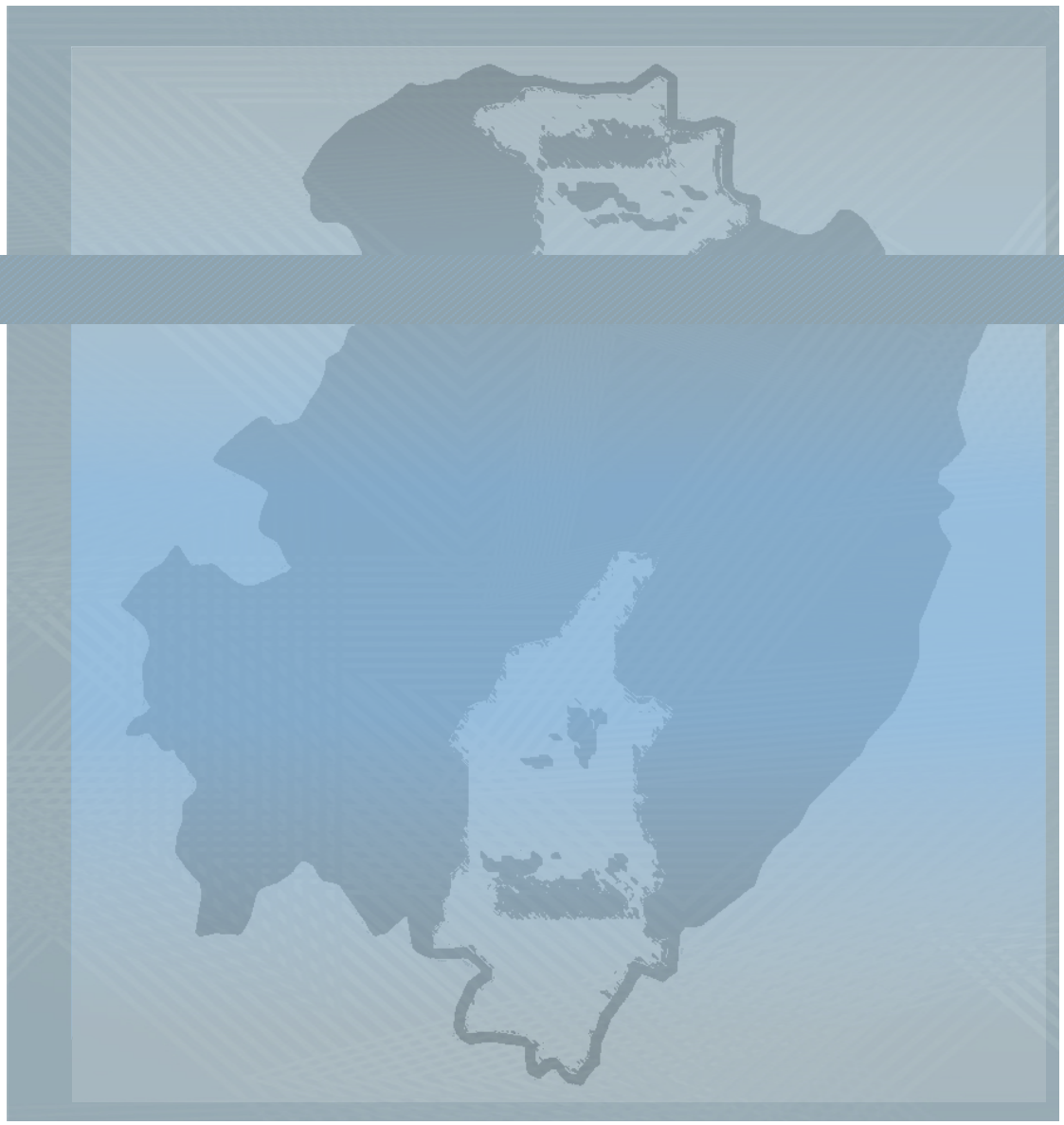
The following specific publication can be provided upon request:

- Harper, S. and Pal, R. (2023) Supply network configuration for resilient high-cost textile and apparel manufacturing supply chains: A Delphi study, EurOMA 2023, July 3-5, Leuven, Belgium.

*Sara Harper – sara.harper@hb.se

References

1. Castillo, C. (2022), “Is there a theory of supply chain resilience? A bibliometric analysis of the literature”, *International Journal of Operations & Production Management*.
2. Choi, T. Y., Narayanan, S., Novak, D., Olhager, J., Sheu, J.-B. and Wiengarten, F. (2021), “Managing extended supply chains”, *Journal of Business Logistics*, 42(2), pp. 200-206.
3. Business of Fashion and McKinsey (2022), *The State of Fashion 2023*, available at: https://www.mckinsey.com/industries/retail/our-insights/ state-of-fashion
4. Hedrich, S., Hügl, J., Ibanez, P. and Magnus, K. (2021), *Revamping fashion sourcing: Speed and flexibility to the fore*, availableat: https://www.mckinsey.com/industries/retail/our-insights/revamping-fashion-sourcing-speed-and-flexibility-to-the-fore
5. van Hoek, R. and Dobrzykowski, D. (2021), “Towards more balanced sourcing strategies – are supply chain risks caused by the COVID-19 pandemic driving reshoring considerations?”, *Supply Chain Management: An International Journal*, 26(6), pp. 689-701.
6. *Resilient supply chains for local textile and clothing production in small series*, available at: https://www.hb.se/ en/research/research-portal/projects/resilient-supply-chains-for-local-textile-and-clothing-production-in-small-series/
7. Srai, J. S. and Gregory, M. (2008), “A supply network configuration perspective on international supply chain development”, *International Journal of Operations & Production Management*, 28(5), pp. 386-411.
8. Chowdhury, M. M. H. and Quaddus, M. (2017), “Supply chain resilience: Conceptualization and scale development using dynamic capability theory*”, International Journal of Production Economics*, 188, pp. 185-204.
9. Datta, P. (2017), “Supply network resilience: A systematic literature review and future research”, *International Journal of Logistics Management*, 28(4), pp. 1387-1424.
10. Moeuf, A., Lamouri, S., Pellerin, R., Tamayo-Giraldo, S., Tobon-Valencia, E. and Eburdy, R. (2019), “Identification of critical success factors, risks and opportunities of Industry 4.0 in SMEs”, *International Journal of Production Research*, 58(5), pp. 1384-1400.



THE SWEDISH SCHOOL
OF TEXTILES
UNIVERSITY OF BORÅS

Sparbanksstiftelsen
Sjuhärad