

re:newcell

**Re-generation of
cellulosic fibres from
used textiles**



re:newcell

“Trailing the paper trail”



Many similarities between paper and synthetic cellulosic textiles

- Same raw material
- Very similar production process
- Wide range of usages
- Paper used to be made from recycled textile rags

“Trailing the paper trail”

Paper recycling started on a large scale in the 1970's

- Early production was sensitive to the type of paper introduced
- Quality issues when increasing volume due to large quantities of non-paper components in raw material
- Over time, both volumes and quality have increased
- Today >60% of paper is collected in Europe
 - 50 % from industry, 40% from households, 10 % from offices
 - Collection is decreasing

“Trailing the paper trail”

The process includes:

- Manual screening of raw material
- De-inking
- Removal of non-paper components



“Trailing the paper trail”

Still challenges facing the paper recycling industry today

- Large volumes are not recyclable
 - Tinted paper, adhesives, multi-layer (wrapping paper), some types of composites (beverage cartons)
 - Quality decreases with multiple recycles
- 5 grades of collected paper
 - Lower grades’ main use is for packaging and newsprint
 - High grade stands for only 10% of volumes (originating mainly from industry and offices)
- Almost all paper can be recycled but much is hindered by the contact with hazardous waste (health care waste, household waste, oil, adhesives)
- Paper recycling industry promotes separated collection



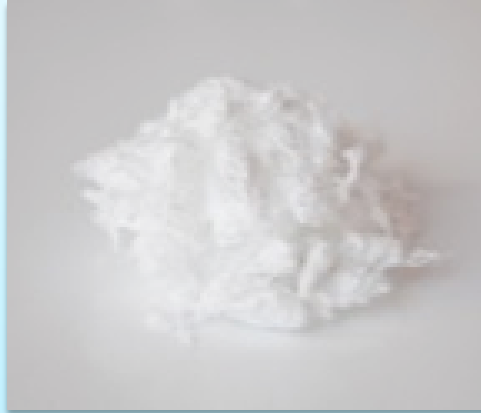
Back to textiles

What re:newcell do



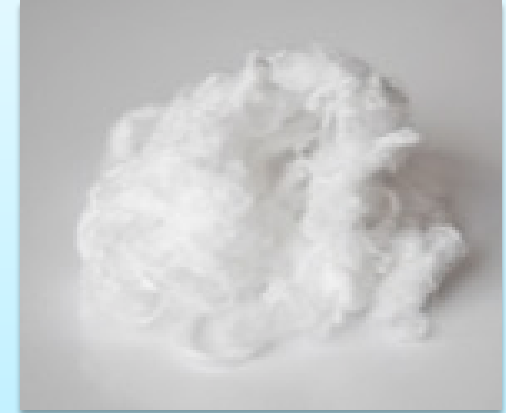
Used textiles

The textiles are ripped and dissolved which allows for the separation of cellulosic fibres from non-cellulosic fibres and non-textile components



re:newcell pulp

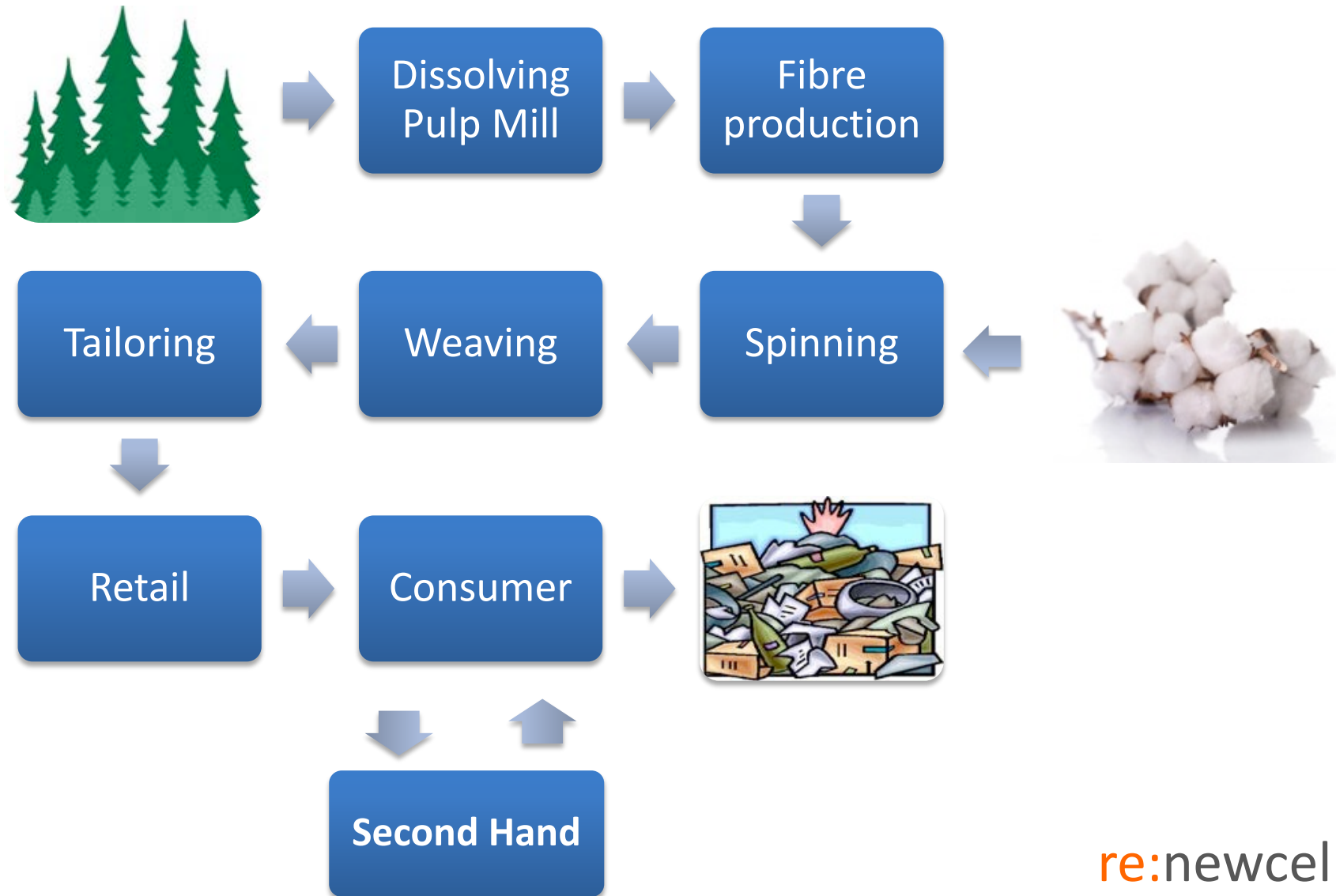
After dissolving the textiles, re:newcell's patented and unique process is able of creating pure and homogenous dissolving pulp



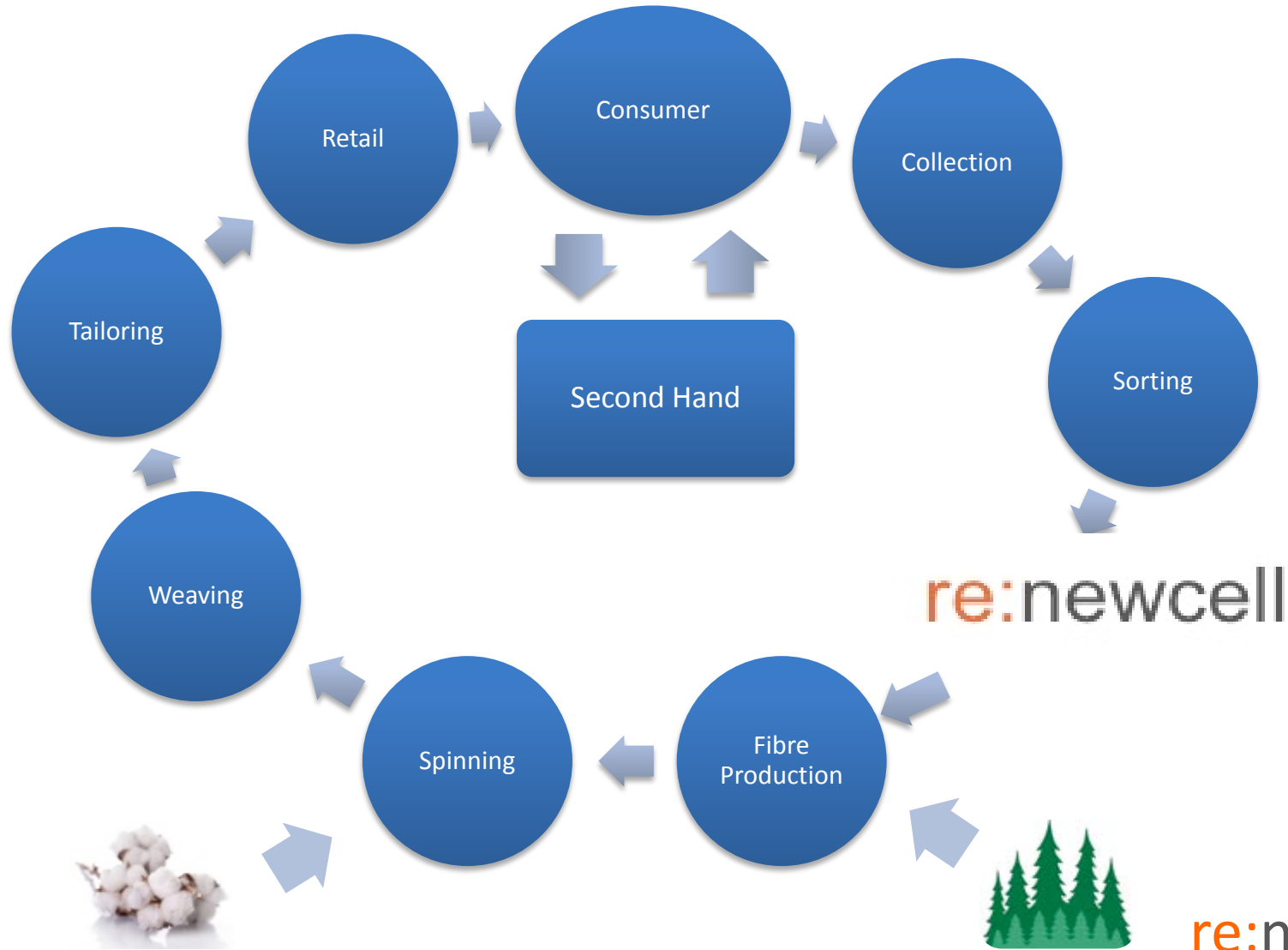
Viscose/from re:newcell pulp

The re:newcell pulp can now be used in the traditional viscose or lyocell process leading to a textile fibre made from 100% recycled fibres!

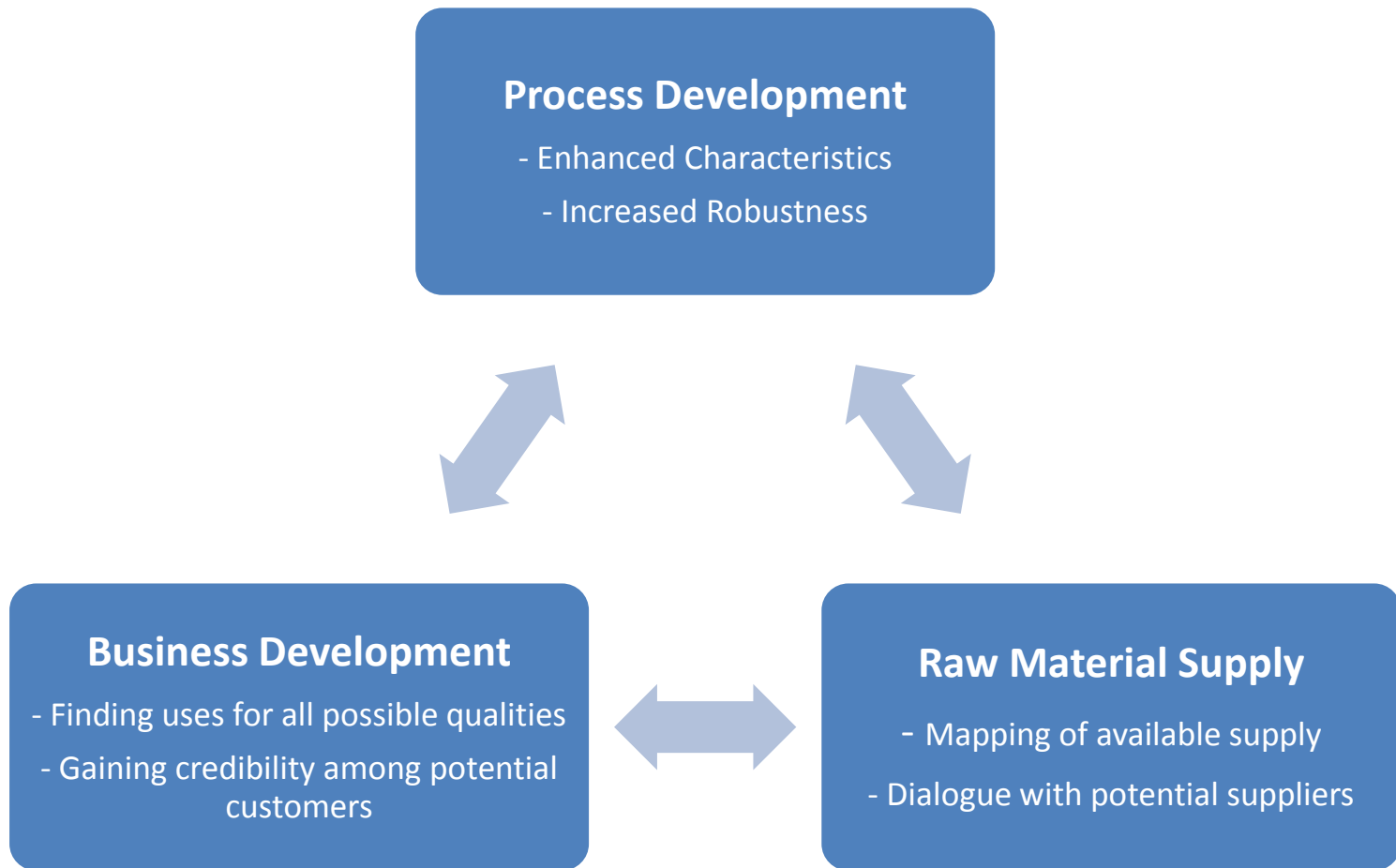
Current production chain



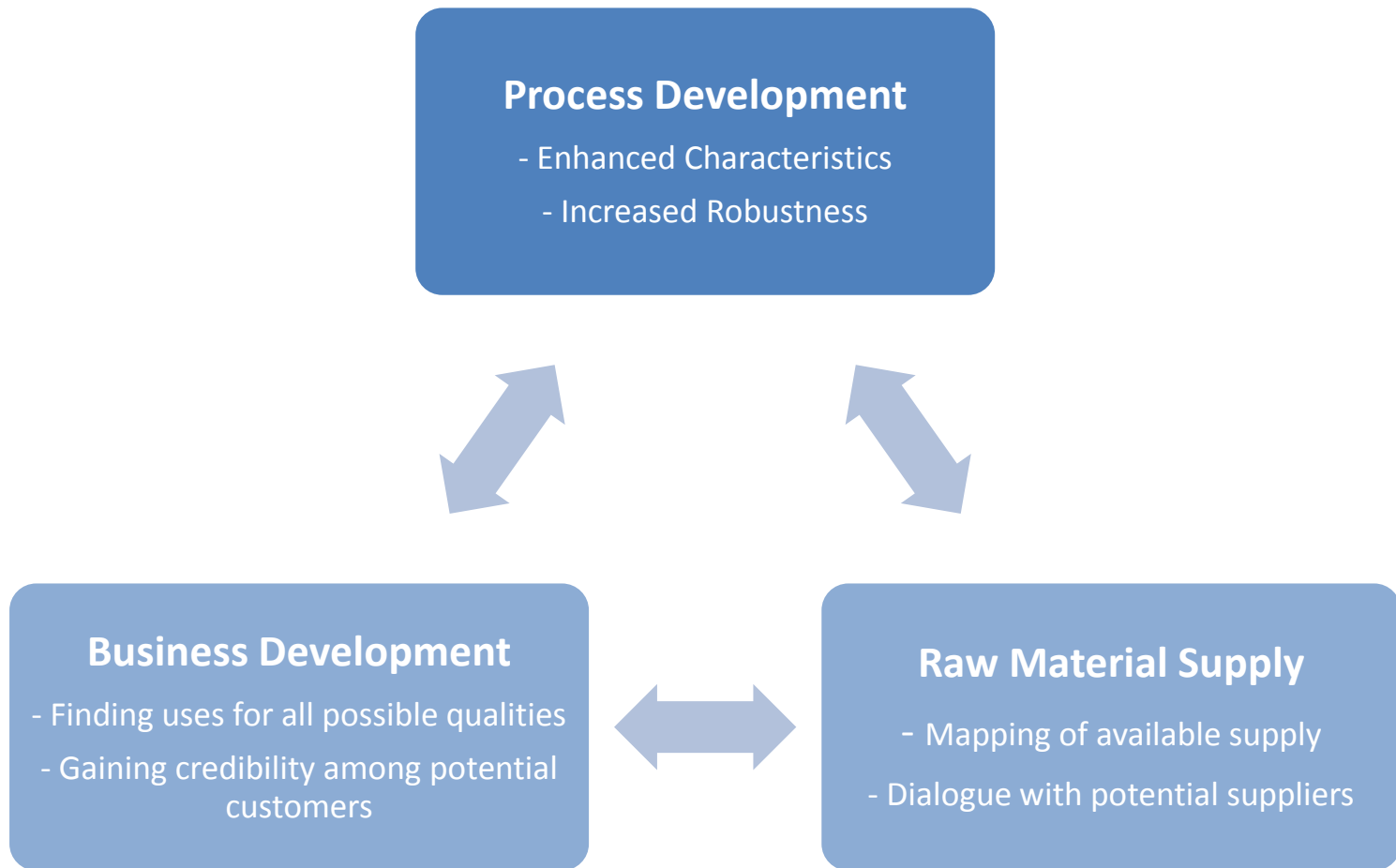
Re:newcells vision



Three main areas of focus



Three main areas of focus



Strengths of the re:newcell process

- Produces very good dissolving pulp from fairly clean cellulosic textiles
- Can separate cellulosic textiles from non-cellulosic components (oil-based fibres, non-textile parts)
- Inexpensive chemicals and low energy requirements
- Can be mixed with virgin pulp thereby allowing larger volumes and less sensitivity to raw material

Challenges to the re:newcell process

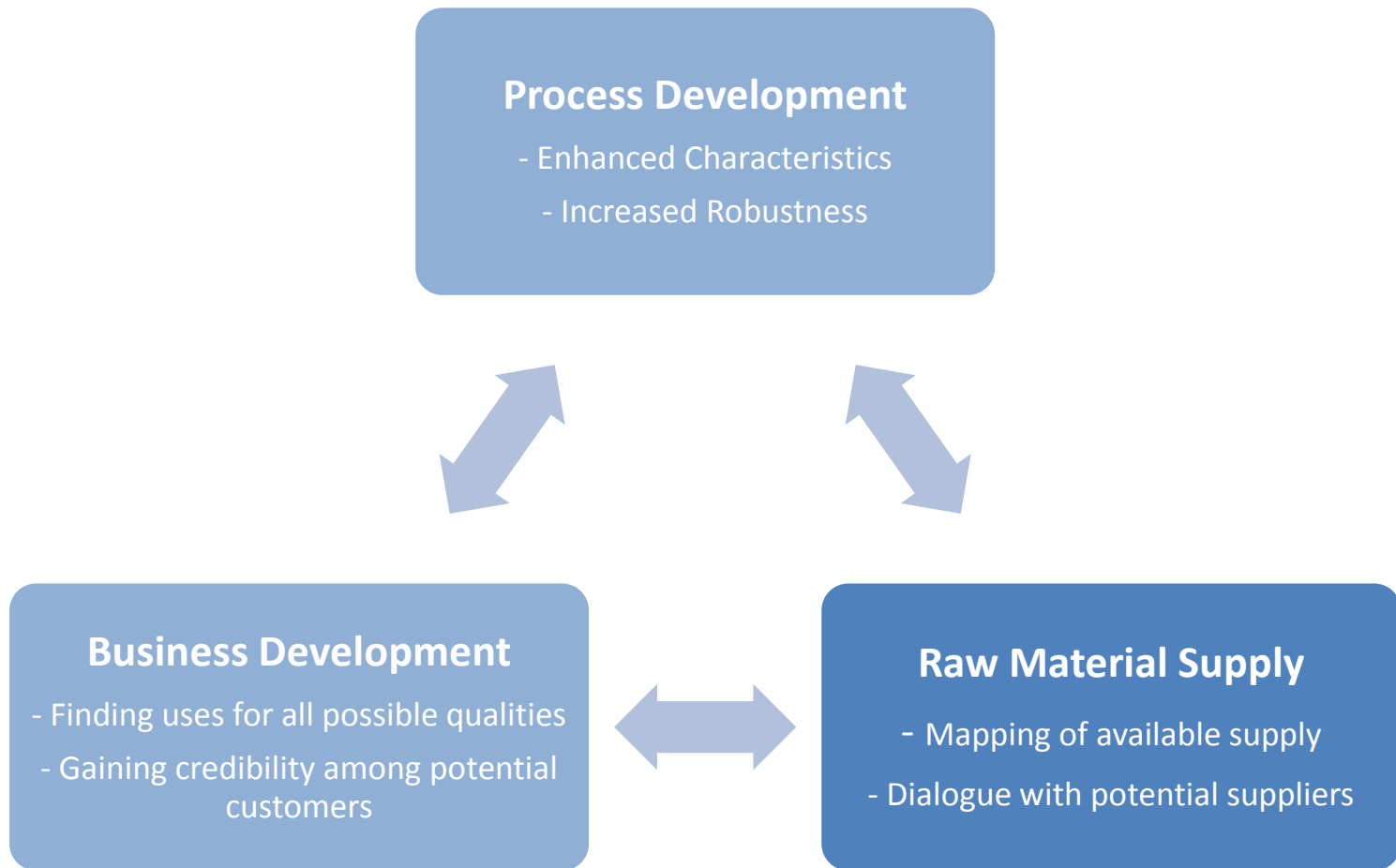
- Quality issues when non-cellulosic portion is high
- Sensitive to state of raw material
- Wide range of pollutants found in raw material
 - Flame retardants
 - Anti-wrinkle
 - “Past life”
- Wide range of dyes which must be decoloured

By-products and waste products

- By-product management
 - Oil-based fibres
 - Natural fibres
 - Dyes?
- Waste product management
 - Chemicals
 - Zippers, buttons etc



Three main areas of focus



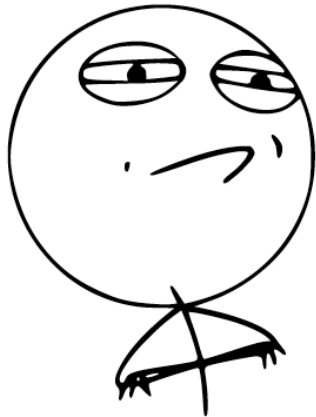
Challenges await



If we could we would like to buy large volumes of exactly the same textile at a very low cost.....but

- Different sources provide different types of raw material
- Consumers aren't used to sorting out textiles from other waste
- Characterisation of used textiles is difficult
- All textiles are burdened by their former life

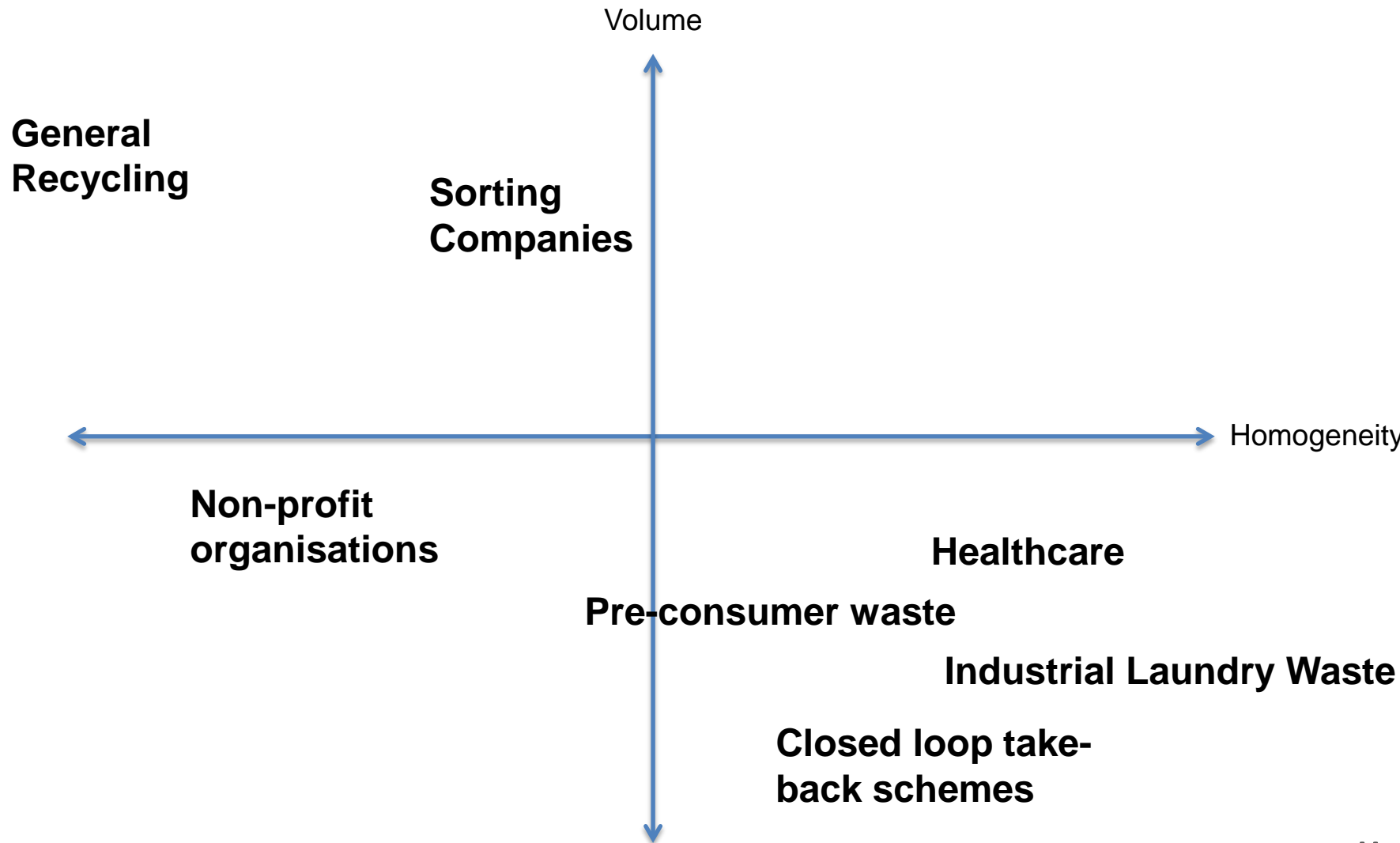
Challenges await



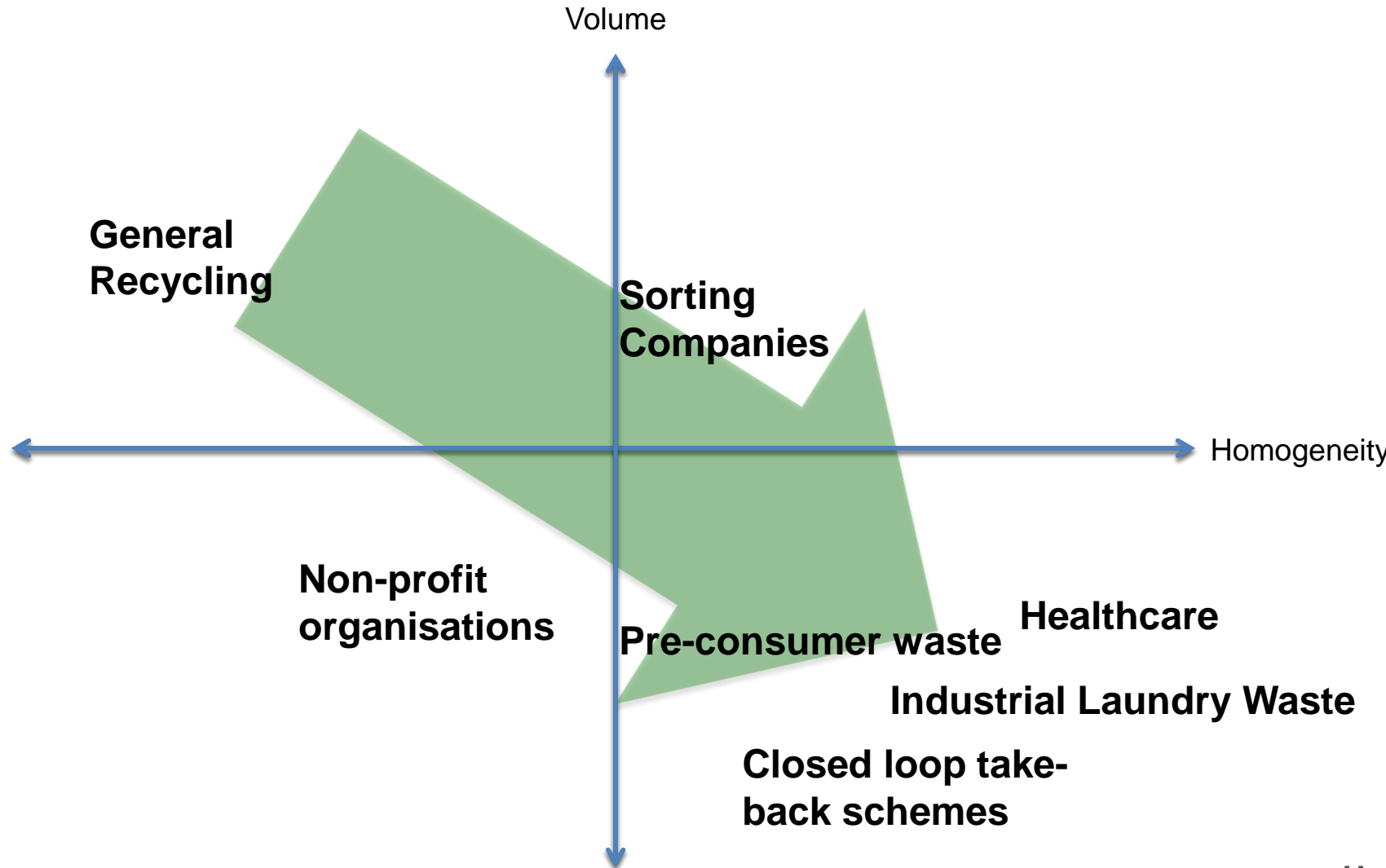
CHALLENGE ACCEPTED

- re:newcell's initial strategy is to focus on low volume/high quality raw material and migrate towards high volume/low quality over time
- Some sources of raw material are more predictable than others
- Design for recycling will ease future recycling

Potential Suppliers



Better practices will improve raw material



Availability of raw material today

Re:newcell have during the autumn of 2013 been part of a Vinnova-funded project mapping the availability of raw material in Sweden

There should be no problem of sourcing 2000-3000 tons of high quality raw material for a first pilot plant

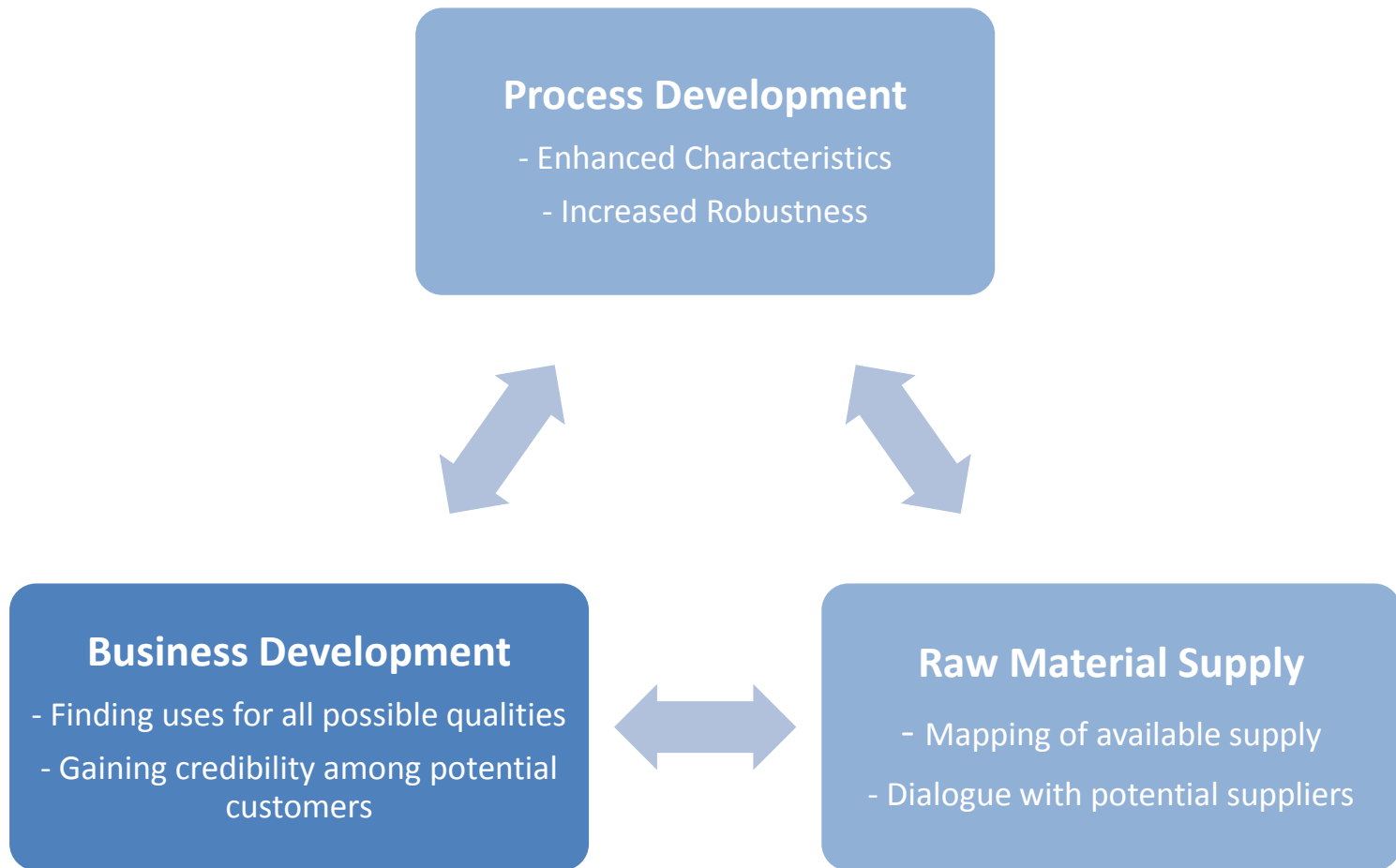
Välgörenhetsorganisationerna

Välgörenhetsorganisation	Textilernas "öden"	Totala mängder
Myrorna	Försäljning i egna secondhand-butiker	
Röda Korset	Export för sortering av utländsk aktör ->	
Stadsmissionen	- Industriell återanvändning	6 100 ton/år
Emmaus Åland	- Försäljning på intern, secondhand-marknader	
Humana Sverige	Bistånd, som gåvor	
PMU InterLife	Förbränning	1 550 ton/år
Human Bridge (insaml.)	Remake för återbruk	
Erikshjälpen		
Läkarmissionen		
	Av TOTALT utgående	23 630 ton/år

Nr	Beskrivning	Import	Export	Netto
1	Sänglinne, handdukar	13 811	2 493	11 318
2	Gardiner, bordslinne	4 181	1 021	3 160
3	Sängöverkast, filtar mm	1 592	622	970
4	Babykläder	2 167	438	1 729
5	Underkläder, nattkläder mm	8 606	1 476	7 130
6	T-shirts, tröjor	17 961	4 092	13 869
7	Skjortor, blusar	6 005	1 410	4 595

”Plockanalyser har visat att vi slänger cirka åtta kilo textilt avfall per person, totalt 70 000 ton, per år”
Borås Textilhögskola

The Process



Potential Customers

- Fibre producers
 - Viscose, Lyocell etc
- Dissolving pulp producers
 - Possible to integrate the process with dissolving pulp mills
- Non-woven products
 - Usually lower purity requirements
 - Products such as medical gowns, diapers, sponge cloths etc.
 - Could be customers for low quality batches



Going Forward

- re:newcell ready to test the technology on a larger scale
- re:newcell have completed a pre-project planning for a 2000 ton/annum plant
- Discussions on-going with relevant potential partners and financiers
- Hope to make a decision during this year

If they could do it with paper, we can do it with textiles!

