

# Index

## A

### Abaca fibers

- automotive industry, 23
- chemical structure, 14–17
- composite structures, 14, 25
- designed applications, 20, 25
- fashion and design, 26
- groups, 8
- industrial applications, 23
- Mercedes-Benz A-series vehicles, 24
- plant (*see* Abaca plant)
- production methods (*see* Production methods, abaca fibers)
- properties, 2, 3, 17, 18
- roofing materials, 24
- textile design contribution, 19, 20
- usage applications, 3

### Abaca plant

- cultivation and agriculture, 7, 8
- FAO, 6
- humid tropical regions, 4
- Manila hemp, 4, 6
- nonedible banana, 5
- plant age, 5
- production, 6

### Accenture Strategy Report (2018), 244

### *Acetobacter xylinum*, 112, 113

### Additive repurposing

- Altered*, 209, 210
- comparative analysis, 212, 213
- GREEN*, 210, 212

### Adsorbable organohalogen (AOX), 165, 181

### Apparel industry

- challenges, 35
- environmental problems, 33

### apparel production, 34

### textile manufacturing, 33

### textile production, 34

### patternmaking impacts, 35

### production, 32

### professionals, 33

### zero waste patternmaking, 33

### Applications, UV technology

### coloration process, 172

### decolorization and purification, 174, 175

### pilling problem, 181, 182

### pretreatment and surface

### modification, 176–179

### rapid oxidation, 173

### surface treatments, 172

### sustainable process design, 173, 174

### UV curing, 179–181

### Arecaceae, 69

### *Aspergillus niger*, 121

### AutoCAD, 284

## B

### Bacteria, 110, 111, 114, 115, 117, 119, 122

### Bacterial cellulose, 110

### advantages, pigments, 118

### agricultural plant products, 115

### autogenic textile design, 120

### BioCouture, 111

### chemical and natural mordants, 121

### chemical structure, 113

### commercial applications, 114

### detection and synthesis methods, 111

### garments, 115

### industrial scale, 118

- Bacterial cellulose (*cont.*)  
 industry, 117  
 innovative applications, 116  
 intermolecular and molecular hydrogen bonds, 112  
 lignin/hemicellulose, 116  
 mechanical properties, 112, 113  
 microorganisms, 117  
 natural plant dyes, 117  
 natural resources, 117  
 oil-based fibers, 111  
 organisms, 112  
 pH values, 121  
 pigment-producing bacteria, 117  
 plant materials, 111  
 porous structure and width, 112  
 prodigiosin, 118  
 red and purple bacteria, 120  
 red and purple pigments, 117  
 silk fiber fabrics, 120  
 sustainable application, 116  
 textile applications, 116
- Bibliographic compilation, 242
- Biodegradable fibers, 299
- Biodegradable resources, 68, 69, 78, 82
- Bleaching, 264
- Brushing, 264
- Business model, 244, 245
- C**
- Capsule wardrobe, 304–306
- Carbon dioxide (CO<sub>2</sub>) laser, 282
- Cellulosic substances, 72
- Child labor, 246
- Chromobacterium violaceum, 119
- Circular economy (CE), 242–244
- Circular supplies business model, 244
- Circularity, 245
- Clean and dry technologies, 269
- Climate changes, 264
- Clothing swap, 132
- CO<sub>2</sub> laser processes, 265, 267
- Computer-aided design (CAD), 61, 62  
 designers and educators, 88  
 digital patternmaking, 93–96  
 digital textile printing, 95–97  
 micro and macro levels, 89  
 pattern digitizing, 93–96  
 practical growth and development, 88  
 redesign, 88–90  
 redesign activities, 88  
 redesign process and framework applications, 92  
 deconstruction and sorting processes, 92  
 design and construction decisions, 91  
 design planning, 90  
 design properties and aesthetics, 92  
 fabric-driven design method, 91  
 guidelines, 91  
 laser etching and cutting, 92–94  
 materials, 91  
 post-consumer waste, 91  
 post-industrial waste, 91  
 product development model, 90  
 sustainable design framework, 91  
 upcycling process, 90  
 redesigning practices, 88  
 role of designers, 88  
 surface designs and modifications, 88  
 sustainable redesign framework, 88  
 textile and clothing industry, 88  
 textile waste, 89, 90  
 upcycling process, 89, 90
- Computer-aided manufacture (CAM), 61, 62
- Conceptualized model, 295
- Conscious fashion, 250
- Consultancy services, 248
- Consumer awareness, 248, 249, 256
- Consumption of natural resources, 264
- CoreIDRAW, 284
- Cotton, 265
- Cotton fabrics, 265, 270, 276, 277, 283
- Cradle-to-cradle concept, 308
- Cradle-to-cradle system, 129
- Cross-case analysis, 218, 219
- Cutting room waste, 301–303
- D**
- Dead stock clothing waste, 303, 304
- Denim fabrics  
 advantages, 278  
 characteristics, 280  
 coating methods, 281  
 color and mechanical properties, 281  
 color changes, 283  
 color fading effect, 281  
 fabric properties, 280  
 fading mechanism, 279, 280  
 flexibility, 279  
 forms and designs, 284  
 indigo, 277  
 laser engraving, 281  
 manual design, 280  
 Nd:YAG laser, 279  
 non-reproducibility, 280  
 parameters, 281

- pigment printing, 280
    - production, 277
    - pulse energy, 280, 282
    - resolution and pixel time, 279
    - sandblasting method, 280, 281
    - sanding, 278
    - seam types, 282, 283
    - stone washing method, 282
    - surface engraving, 281
    - visual aspects, 278
    - workflow, 278
  - Design education, 306, 308
  - Design for disassembly (DfD), 219, 223, 229
    - description, 139
    - design concept, 139
    - environmental impact, 140
    - factors, 140, 141
    - guidelines, 140
    - stages, 141
    - types, 141
    - use of, 141
  - Design practices, 296
  - Design process, repurposing
    - additive repurposing, 209–213
    - intentional patternmaking, 213–218
    - purpose, 197
    - re-style to repurpose, 198–203
    - subtractive repurposing, 203–207
  - Design strategies
    - capsule wardrobe, 304–306
    - categorization, 294
    - conceptualized model, 295
    - cutting room waste, 301–303
    - dead stock clothing waste, 303, 304
    - eco-design, 299–302
    - life cycle, 293
    - product design innovation level, 294, 295
    - product life cycle, 295, 297–298
    - product-service system innovation level, 295
    - reconstruction technique, 306, 307
    - redesign technique, 306, 307
    - Rs' approach, 293
    - socio-technical system innovation level, 295
    - spatio-social innovation level, 295
    - SPSD, 295, 296
  - Digital textile printing, 95–97
  - Disposable clothing, 290
  - Doodlage
    - CE practices, 257
    - collaboration and innovation, 253, 254
    - conscious fashion, 250
    - consumer awareness, 254
    - consumers, 251
    - design process, 251
    - material sourcing, 250
    - production, 251
    - research, 250
    - retail, 251
    - single-use economy, 252, 253
    - unethical practices, 253
    - upcycled fashion, 250
  - Downcycling, 132, 194, 223
  - Dye adsorption, 265
  - Dyeing, 264
  - Dyes, 110, 115, 117, 118, 123
- E**
- Eco-design, 294, 299–302
  - Ecological consistency, 247
  - Ecological impact, 293
  - Economic development, 78
  - Economic Structural Adjustment Program (ESAP), 58
  - Education for sustainable development (ESD), 291
  - Educational institutions, 292, 293
  - Electromagnetic spectrum, 167
  - Electromagnetic waves, 167
  - Embroidery, 264
  - End-of-life (EoL), 305, 306
    - definition, 149
    - direct recue, 150
    - remanufacturing strategy, 150, 151
    - repurposing, 151
    - types, 150
  - Environmental conscious strategy, 296
  - Environmental consequences, 290
  - Environmental pollution, 2
  - Environmentally friendly
    - fast treatment, 179
    - fibers, 164
    - product functionality, 173
    - substances, 164
    - technologies, 164, 165
    - textile wastewater treatment, 165
    - UV treatment systems, 174
  - European Nature Heritage Fund (EURONATURE), 4
  - Excimer lasers, 279
- F**
- Fabindia, 253, 254
  - Fabric
    - circular-shaped wasted, 43
    - cutting efficiencies, 34
    - designs, 41

- Fabric (*cont.*)  
 production, 34  
 waste challenges, 32  
 waste reduction, 35
- Fading applications, 276, 277
- Fading effect, 276
- Fading mechanism, 279, 280
- Family and Consumer Science (FCS), 221
- Fashion  
 bibliographic compilation, 242  
 business model, 244, 245  
 business models, 243  
 CE, 243, 244  
 consumers, 243  
 definition, 242  
 and design, 264  
 fast fashion, 243  
 linear model, 242  
 methodological approach, 242  
 and sustainability, 264  
 and textile sector, 264
- Fashion economy, 244, 245
- Fashion industry  
 clothing swap, 132  
 consumer interest/purchase  
 behavior, 131  
 cotton, 130  
 design, 134  
 drawbacks, 133  
 focus, 132  
 human phenomenon, 135  
 issues, 129, 132  
 localism, 131  
 production phase, 131  
 recycling and reusing, 132  
 sustainability, 134  
 sustainability prism, 135  
 sustainable fashion, 130  
 sustainable practices, 134, 136  
 TBL, 135  
 terminologies, 130  
 vintage clothing, 133
- Fast fashion, 243, 290–293, 303–305, 308  
 apparels, 129  
 attributes, 131  
 environmental impact, 133  
 focus, 131  
 issues, 132  
 planned obsolescence, 133  
 products, 129, 132  
 raw material, 130  
 trends, 129, 133
- Flax, 265
- Food and Agriculture Organization (FAO), 6
- The Four Actions Sustainable Fashion Value (FASFV) framework, 242, 256  
 audit instrument, 249  
 collaboration and innovation, 247, 248  
 consumer awareness, 248, 249  
 single-use economy, 245, 246  
 unethical practices, 246, 247
- Fourth Industrial Revolution (4IR)  
 technologies, 247
- G**
- Garments' life cycle, 137, 298
- Glass fabrics, 274
- Global warming, 264
- Gluconacetobacter xylinus*, 113
- Green design, 294
- Green dry-cleaning, 255
- H**
- High-power lasers, 267
- Hot lasers, 267
- I**
- Incineration, 275
- Indigo, 277
- Industrial sustainability (IS), 54
- Industrialization, 264
- Intentional patternmaking  
 comparative analysis, 217, 218  
*Repurposed Bustier*, 213, 214  
*Suit of the Youth*, 215–217
- International Institute for Sustainable Development (IISD), 130
- International Wool Secretariat (IWS), 178
- J**
- Jigsaw method, 41
- Jusi, 21
- K**
- Knitted plush fabrics, 275
- Korean Institute of Materials Science (KIMS), 24
- L**
- La Courtepointe*, 203–205
- Lapped seam type (LSb), 283

Lapped seam type (LSc), 283

Laser

- applications, 267
- characteristics, 267, 268
- classification, 267, 268
- CO<sub>2</sub>, 267
- definition, 266
- electromagnetic spectrum, 266
- light amplification, 266
- low-energy, 266
- principle, 266
- regularity, 267
- in textile sector, 267

Laser cutting, 88, 92–94, 99, 103

Laser cutting technology, 274–276

Laser engraving, 274–276

Laser etching, 88, 92–94, 99, 100

Laser marking, 274–276

Laser printing process, 275

Laser technology

- automatic control, 284
- cutting, 265
- definition, 267
- denim production, 265
- high- and low-power laser, 265
- low cost and low environmental, 265
- marking, 265
- mustache, attrition, fading and design effects, 282

textiles

- advantages, 269
- clean and dry technologies, 269
- cotton fabrics, 270
- denim fabrics, 277–284
- dyeing and printing processes, 270
- environmental awareness, 269
- fabric cutting and engraving, 274–276
- fading applications, 276, 277
- glass fabrics, 274
- pollution reduction, 270
- polyamide fabrics, 273
- polyester fabrics, 272, 273
- usage areas, 269
- wool fabrics, 271, 272
- water-free method, 265

Laser-assisted dyeing technology, 271

Laser-irradiated wool fiber, 271

Levis life cycle analysis data, 264

Light amplification, 266

Localism, 131

Low-energy laser, 266

Low-power laser, 267

**M**

Manila hemp

- commercial usefulness, 6
- cord fibers, 2
- EURONATURE, 4
- Philippine islands, 4, 6
- tensile strength, 18
- See also* Abaca fibers

Manipal Academy of Higher Education

- (MAHE), 295, 296, 299, 301, 303, 305, 306, 308

Mechanical fiber extraction methods, 71–72

Mechanical methods, 72

Microbial cellulose, 110

Modern art museum (MOCA), 120

Multifiber Arrangement (MFA), 58, 61

**N**

Natural fibers, 68, 76, 83

- abaca fibers, 3, 9, 17, 18
- biocomposite structures, 24
- industrial raw materials, 3
- leaf fibers, 2
- mechanical properties, 23
- plant-based textile fibers, 2
- PP composite structures, 25

Nature-inspired design, 294

Nd:YAG laser, 279

*NEXT*, 206, 207

**O**

*On the Fringe*, 198–200, 202, 203

**P**

Pattern digitizing, 88, 92–95, 103

Patternmaking technique study and application (PMTSA), 37, 39

Permonosulfuric acid (PMS), 178

Person product attachment (PPA), 60

Petroleum-based fibers, 110

Photo-initiated polymerization, 180

Photo-modification, 177

Photon energy, 266

Photoshop, 284

Pigment printing, 280

Poly(ethylene terephthalate) (PET), 280

Poly(trimethylene terephthalate) (PTT), 166

Polyamide (nylon), 280

Polyamide fabrics, 273

Polyester fabrics, 272, 273

Polymethyl methacrylate (PMMA), 280

- Polypropylene (PP), 24, 280  
 Population growth, 264  
 Post-consumer textile waste, 209  
 Power densities, 279  
 Power of cascaded use, 244  
 Power of circling longer, 244  
 Power of pure circles, 244  
 Pre-consumer textile wastes (PrCTW), 209,  
     222, 223, 301  
 Pretreatment and surface modification  
     commercial applications, 179  
     cotton bleaching, 176  
     environmentally friendly, 179  
     photo-degradation, 177  
     photo-modification, 177  
     premodification, 176  
     radiation curing applications, 176  
     Siroflash process, 178  
     UV radiation pretreatment, 178  
     UV/O<sub>3</sub> treatment, 177  
     UV/ozone irradiation, 178  
     UV-irradiated fabric, 177  
 Printing, 264  
 Prodigiosin, 118  
 Product as a service business model, 245  
 Product design innovation level, 294  
 Product life extension, 244  
 Product swapping, 248  
 Production methods, abaca fibers  
     gum removal process, 13  
     mechanical process, 11, 12  
     retting process, 9, 10  
 Product/service systems (PSS)  
     categories, 148  
     definition, 148  
     designers, 148  
     environmental-oriented system, 148  
     guidelines, 148, 149  
     market-driven consumption pattern, 147  
     services, 148  
 Pulse energy, 280, 282
- Q**
- Q-key scanning, 280  
 Quick response (QR) manufacturing  
     methods, 291
- R**
- Raffia palm fiber  
     applications areas, 78–82  
     chemical properties, 76, 78  
     composite structures, 68  
     consumption, 68  
     cultivation, 69, 71  
     designed products, 69  
     designs, 69, 78, 82  
     environmental pollution, 68  
     food sector, 68  
     habits of settlement, 68  
     mechanical properties, 77, 78  
     physical and chemical  
         structure, 74, 76  
     physical properties, 76, 78  
     production methods  
         gum removal, 73, 74  
         hypodermis, 71  
         leaf fibers, 71  
         mechanical methods, 72  
         retting method, 72, 73  
     *Raphia hookeri* species, 69  
     regions, 69  
     sustainability, 68  
     textile sector, 68  
*Raffia taedigera*, 78–79  
*Raphia farinifera*, 71  
*Raphia hookeri*, 71  
*Raphia vinifera*, 71  
 Re Fab, 254  
 Ready-to-wear (RTW) clothing, 89  
 Renewable, 2, 8, 20, 25, 68, 82, 83  
 Repurposing  
     C2CAD model, 195  
     cross-case analysis, 218, 219  
     data collection, 228  
     education, 222  
     in-depth description and analysis, 192  
     interpretation, 228  
     interview protocol, 230  
     levels (*see* Design process, repurposing)  
     operative process, 222  
     research and consideration  
         consumer mindsets, 219, 220  
         donation process, 220  
         education, 220, 221  
     research design, 225, 227  
     research plan, 226  
     reuse and redesign, 194  
     sustainability, 193  
     sustainable apparel, 194  
     sustainable fashion, 222  
     textile products, 221  
 Resource recovery, 244  
 Resource-efficient society, 247  
 Re-style to repurpose  
     comparative analysis, 202, 203  
     *On the Fringe*, 198–200

*Upside-Down Jean Crop Top*, 200–202  
Retting method, 72, 73

## S

- Sandblasting, 264, 280, 281
- Sandpapering, 264
- Scraping, 11
- Secondhand
  - clothing items, 202
  - clothing markets, 192
  - clothing stream, 207
  - fashion items, 195
  - market stream, 217–219
  - products, 201, 222
  - retailer, 210, 215
- Semi-structured interviews, 242
- Serratia Marcescens*, 119, 121
- Sharing platform business model, 245
- Silk, 265
- Single-use economy, 245, 246, 252, 253, 256
- Siroflash anti-pilling process, 166
- Siroflash process, 178
- Slower consumption/longevity
  - design stage, 142
  - design theory, 143
  - fast fashion consumers, 144
  - principles, 143
  - semi-tailored garments, 143
  - strategies, 144
  - WRAP, 143
- Societal consequences, 290
- Socio-technical system innovation level, 295
- Soft laser, 267
- Soil fungi, 72
- South-West Democratic Republic of Congo, 80
- Spatio-social innovation level, 295
- Stone washing method, 282
- Streptomyces*, 122
- Subtractive repurposing
  - comparative analysis, 207
  - La Courtepointe*, 203–205
  - NEXT*, 206, 207
- Superimposed seam type (SSa), 282–283
- Surface engraving, 281
- Sustainability, 2, 19, 25
  - clothing and textile industries, 128
  - definition, 128
  - design strategies (*see* Design strategies)
  - educational institutions, 292, 293
  - and fast fashion, 291, 292
  - goals, 128
  - principle of creating, 250
  - student projects, 306, 308 (*see* Sustainable textile design)
- Sustainability prism, 135, 136
- Sustainability research, 242
- Sustainable
  - abaca fibers, 4, 19, 20
  - fashion (*see* Fashion)
  - habitat conservation, 4
  - textile designs, 2
- Sustainable apparel, 194, 195
- Sustainable design, 269
- Sustainable design framework
  - CAD application, 99–102
  - extraction and concept, 98–101
  - material collection, 98–101
- Sustainable design strategies
  - challenges, 151, 152
  - DfD, 139–142
  - environmental principles, 137
  - EoL, 149–151
  - garment design, 137
  - PSS, 147–149
  - slower consumption/longevity, 142–144
  - social well-being, 144, 145
  - user participation, 146, 147
  - waste minimization/zero waste, 138, 139
- Sustainable fashion, 20, 194
- Sustainable fashion design
  - fashion industry (*see* Fashion industry)
  - strategies (*see* Sustainable design strategies)
- Sustainable fashion practices, 151, 153–155
- Sustainable product and service development (SPSD), 295, 296
- Sustainable textile design
  - application of, 54
  - bacteria, 110
  - consumers' consumption, 59, 60
  - conventional dyeing processes, 110
  - cooperation, 59
  - cost of labour, 60, 61
  - environmental burden, 53
  - fabric designs, 61
  - fabrics, 111
  - implementation, 60
  - industrial sustainability (IS), 54
  - industry, 59
  - internal and external functions, 59
  - Kadoma, 57
  - laws and policies, 58, 59
  - microbial dyes, 111
  - natural/synthetic fibers, 110
  - number of factors, 54
  - petroleum-based fibers, 110

Sustainable textile design (*cont.*)  
 process, 62  
 product sustainability, 54  
 production processes, 54  
 product-service system, 55  
 recommendation  
 adaptation of sustainable initiatives, 64  
 collaboration, 64  
 consumer consumption, 64, 65  
 strategies, 63  
 recycling, 55  
 resources, 57, 58  
 social and economic development, 54  
 social responsibility, 55  
 upcycling, 56  
 Sustainable textile material, 54–56, 60, 64  
 Synthetic fibers, 96, 280

## T

Tessellation, 43  
 Textile, 68, 72, 78, 81–83  
 applications, 264  
 and fashion industry, 164  
 Textile sector, 68  
 Throwaway culture, 290  
 Time-saving technologies, 164  
 Torque-free ring-spun yarn, 282  
 Traditional ring-spun yarn, 282  
 Transformational Reconstruction (TR)  
 method, 42  
 Triple bottom line (TBL), 135

## U

Ultraviolet (UV)  
 “beyond violet”, 167  
 electromagnetic spectrum, 164  
 history, 170  
 long-wave UV (UV-A), 168, 169  
 middle-wave UV (UV-B), 169  
 radiation, 168  
 short-wave UV (UV-C), 169  
 UVR, 168  
 Vacuum UV, 170  
 Ultraviolet radiation (UVR), 168  
 Unfair wages, 246  
 Unhealthy working environment, 246  
 United Nations World Commission on  
 Environment and Development  
 (2018), 54  
 Upcycling, 132, 194, 223, 224, 242, 245, 250  
*Upside-Down Jean Crop Top*, 200–203  
 Use-oriented economy needs, 248

UV curing  
 acrylate-based resins, 180  
 conventional cellulosic substrates, 181  
 conventional thermal hardening  
 techniques, 180  
 inkjet printing, 181  
 light-dependent polymerization, 179  
 photo-initiated polymerization, 180  
 radical-type systems, 180  
 water and oil repellency, 181  
 UV technology  
 advantages, 166  
 applications (*see* Applications, UV  
 technology)  
 environment friendly, 176  
 forensic analysis, 171  
 purposes, 166  
 surface modifications, 172  
 UV/ozone irradiation, 178

## V

Value-added products, 284  
 Value-generating principles, 244  
*Vancomycin-resistant Staphylococcus aureus*  
 (VRSA), 119  
 Vintage clothing, 133

## W

Water-free method, 265  
 Wool fabrics, 271, 272

## Z

Zero- and minimal waste design, 194  
 Zero material wastage, 250  
 Zero-waste, 247, 251  
 Zero waste design approaches  
 analysis, 39, 40  
 apparel design process, 46  
 rectangular cuts paradigm, 39–41, 45, 46  
 tailoring matrix paradigm, 41, 42, 46  
 Zero waste fashion design, 36  
 Zero waste patternmaking  
 analysis method  
 content analysis, 38  
 Lindqvist’s two paradigms of  
 clothing, 38  
 apparel industry professionals, 33  
 apparel manufacturing process  
 benefits, 47  
 challenges, 47, 48  
 benefits, 35, 44



- challenges, 44, 45, 49
- data collection
  - class part, 36
  - publicly available collected
    - examples, 36
    - stage 1, 36
- definition, 35
- garment outcomes
  - loose and boxy silhouette, 43, 47
  - shoulders, 44
- implications, 33, 45
- organizational scheme, 49
- PMTSA, 37, 39
- principles, 35
- research questions, 32
- stages, 36
- strategies
  - body openings, 43
  - cutout pieces usage, 43
  - merge seams, 43
  - tessellation, 43
  - wrapping, 43
- zero waste design approaches (*see* Zero waste design approaches)