

MICRO-TREND OF INCREASING FLEXIBILITY OF MULTILAYER COMPOSITE

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Introduction

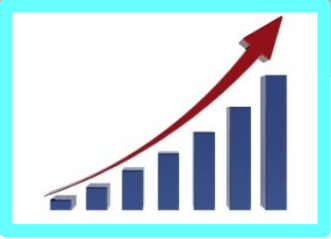
삼성SDI

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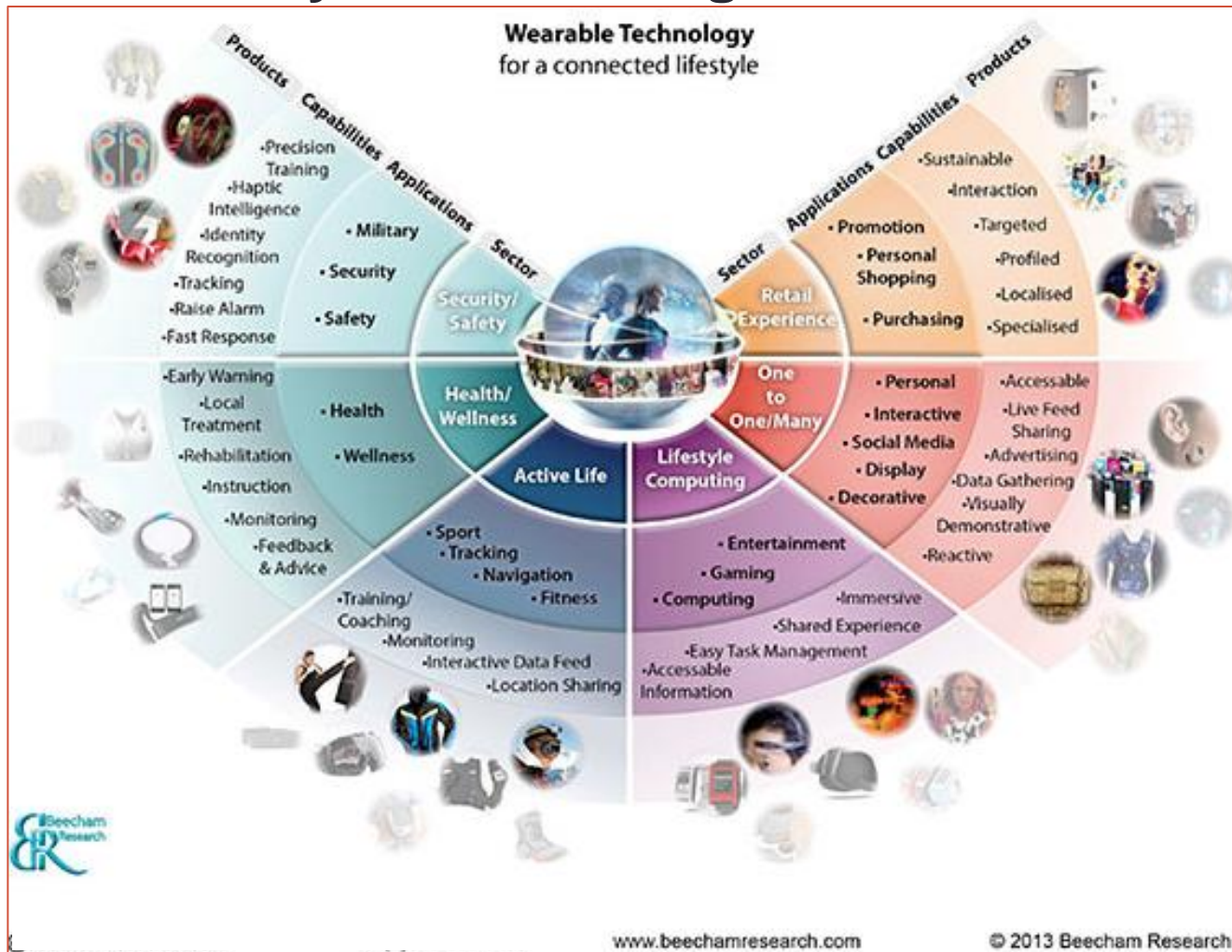
Next Big Things ??

<http://www.samsungsdi.com/>



Introduction

Wearable Tech: Maybe A New Mega Trend



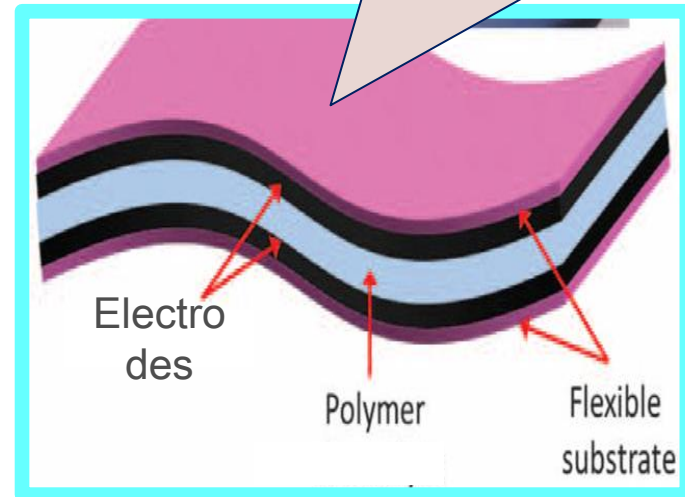
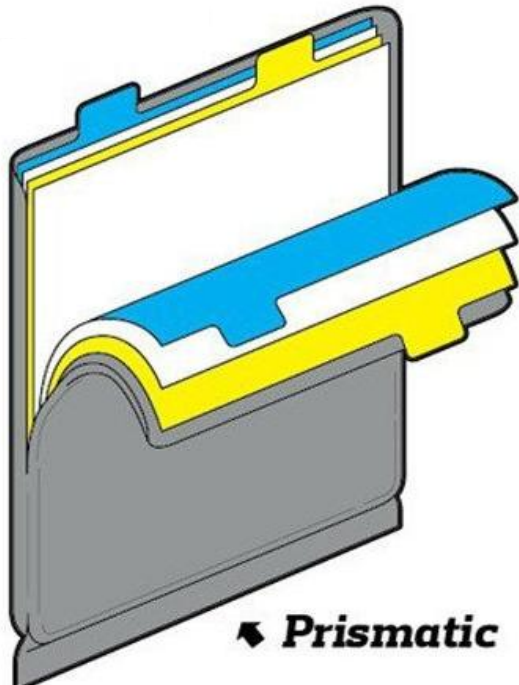
Project goal & restrictions

Goal:

to develop design-concepts 1D flexible battery

Main restriction:

maximally closely for existing technology



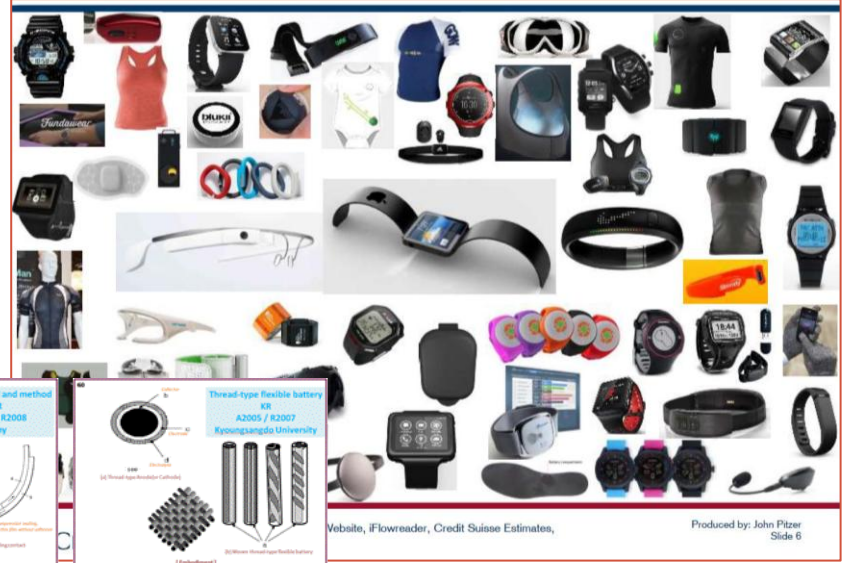
Multilayer composite:

- Metal sheet & Foil
- Polymer film
- Membrane (+ceramic coating)
- Paste (slurry)
- Liquid

Landscaping (fragment)

Gadgets' Prototypes

Flexible battery design →
~300 Patents

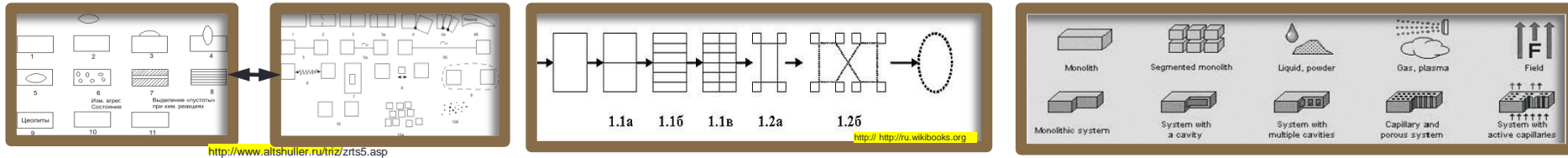


<p>Rectangular battery US A1995 / R1996 Sony</p>	<p>Integrated battery KR A2004 / R2006 Panasonic</p>	<p>Cable Type Secondary Battery Having Metal Coated Polymer Collector US A2010 LG Chem</p>	<p>Secondary cell and method KR A2001 / R2008 Sony</p>	<p>Thread-type flexible battery KR A2001 / R2007 Kyoungsangda University</p>
<p>Method of manufacturing a lithium battery KR A2004 / R2010 Royal Philips Electronics</p>	<p>Assembled Battery JP A13995 TOSHIBA</p>	<p>Bendable battery KR A2002 / R2008 SDI</p>	<p>Electrochemical cell laminate for alkali metal polymer batteries US A3001 / R3004 AVESTOR LIMITED PARTNERSHIP</p>	<p>Folded plate electrode assemblies for battery cathodes US A2004 / R2006 Medtronic</p>
<p>Flexible Electronic Devices US A2011 APPLE</p>	<p>Woven battery JP A13999 Sony</p>	<p>Manufacture of flexible thin layer electrochemical cell US A2001 / R2004 Power Paper</p>	<p>Multiple cell battery US A2001 / R2010 Nissan Motor</p>	<p>Flexible energy storage devices US A2007 / R2012 Commonwealth Scientific and Industrial Research Organisation</p>
<p>Li secondary battery comprising individual cells connected with one another KR A2001 / R1996 Royal Philips Electronics</p>	<p>Wire type batteries for wireless charge KR A2007 Kyoungsangda University</p>	<p>Cable-Type Secondary Battery US A2999 / R1996 Eastman Kodak Company</p>	<p>Filmstrip and flexible battery US A2999 / R1996 Eastman Kodak Company</p>	<p>Battery arrangement for wrist-carried device US A3004 Huel-Hahn Sun</p>

Website, iFlowreader, Credit Suisse Estimates, Produced by: John Pitzer Slide 6

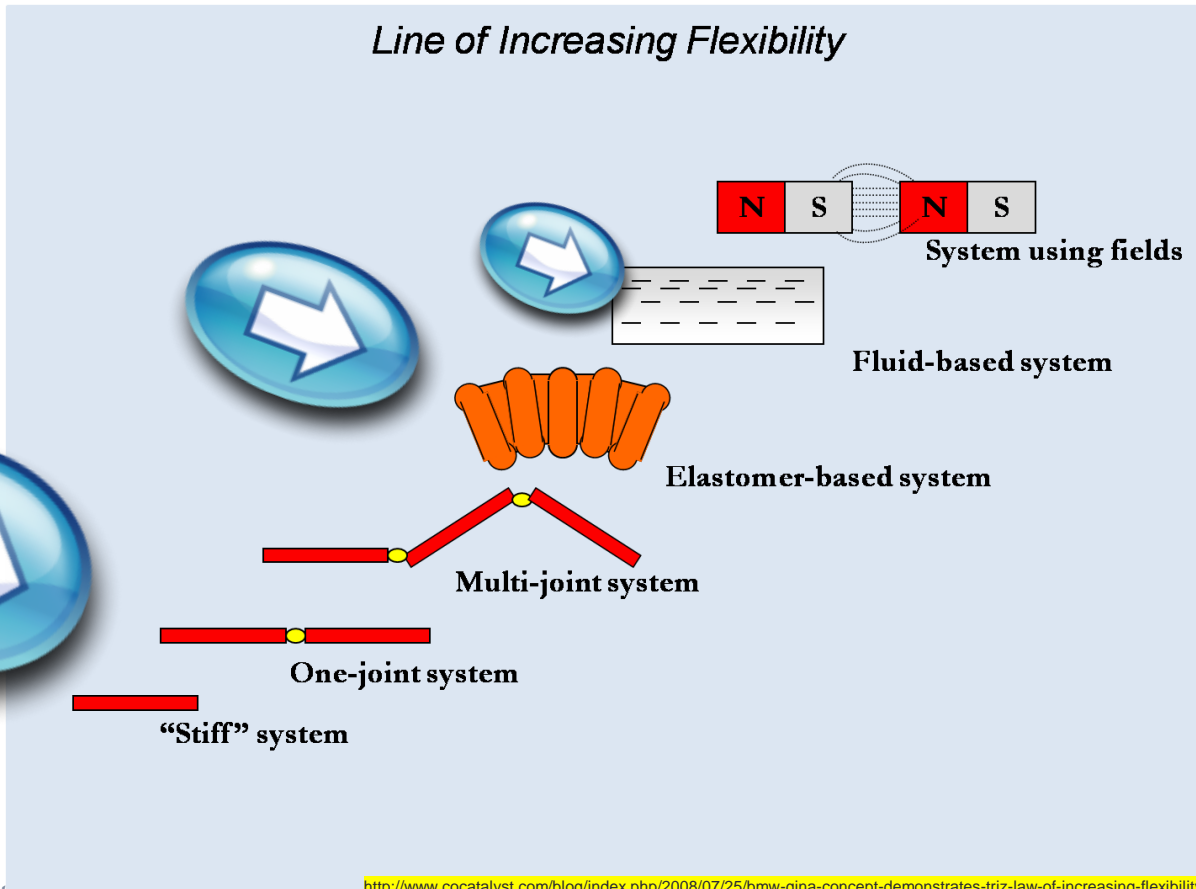
No Patent No Future

TRIZ toolset for increasing flexibility (review)

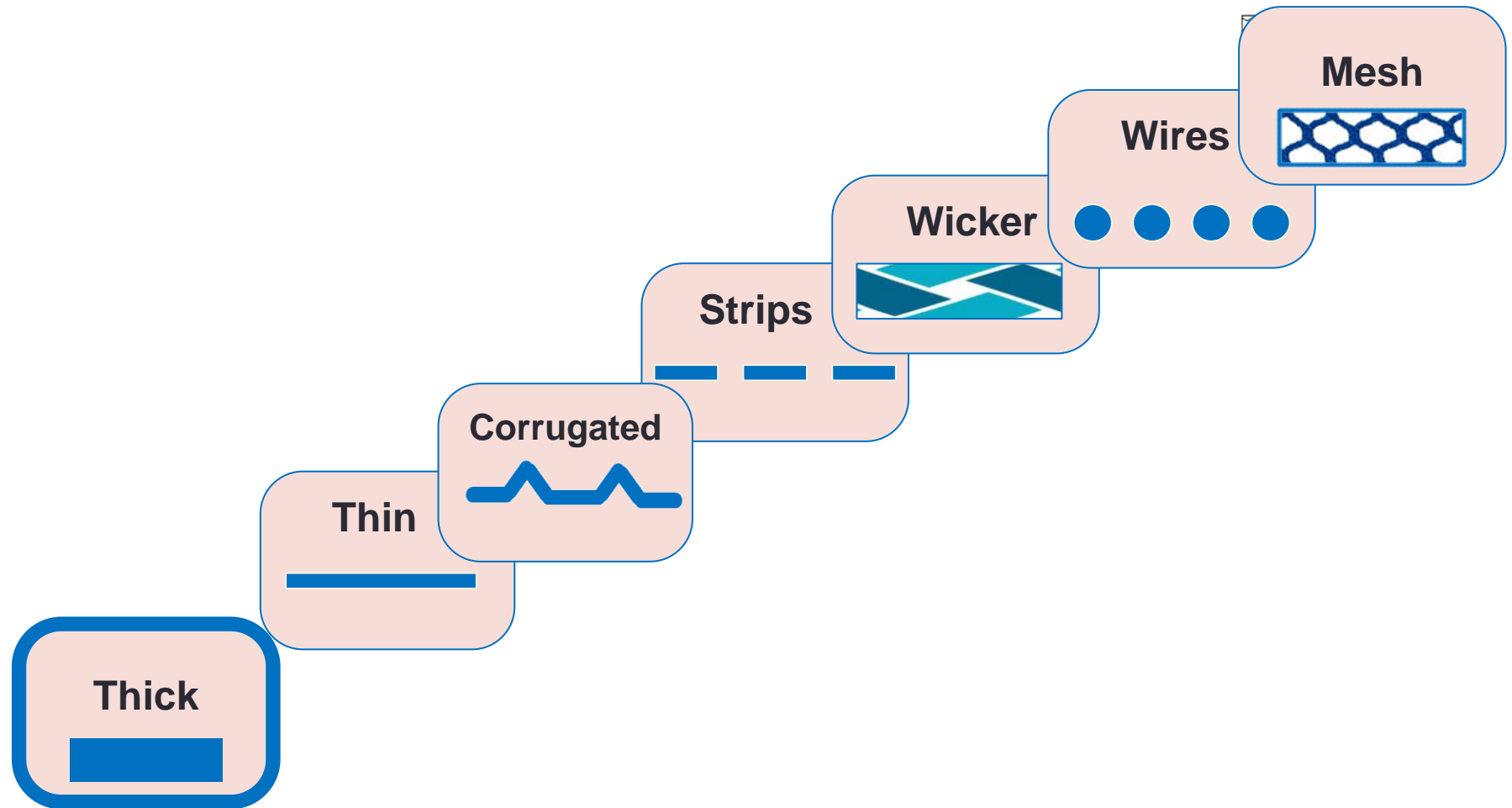


<http://www.altshuler.ru/triz/zrts5.asp>

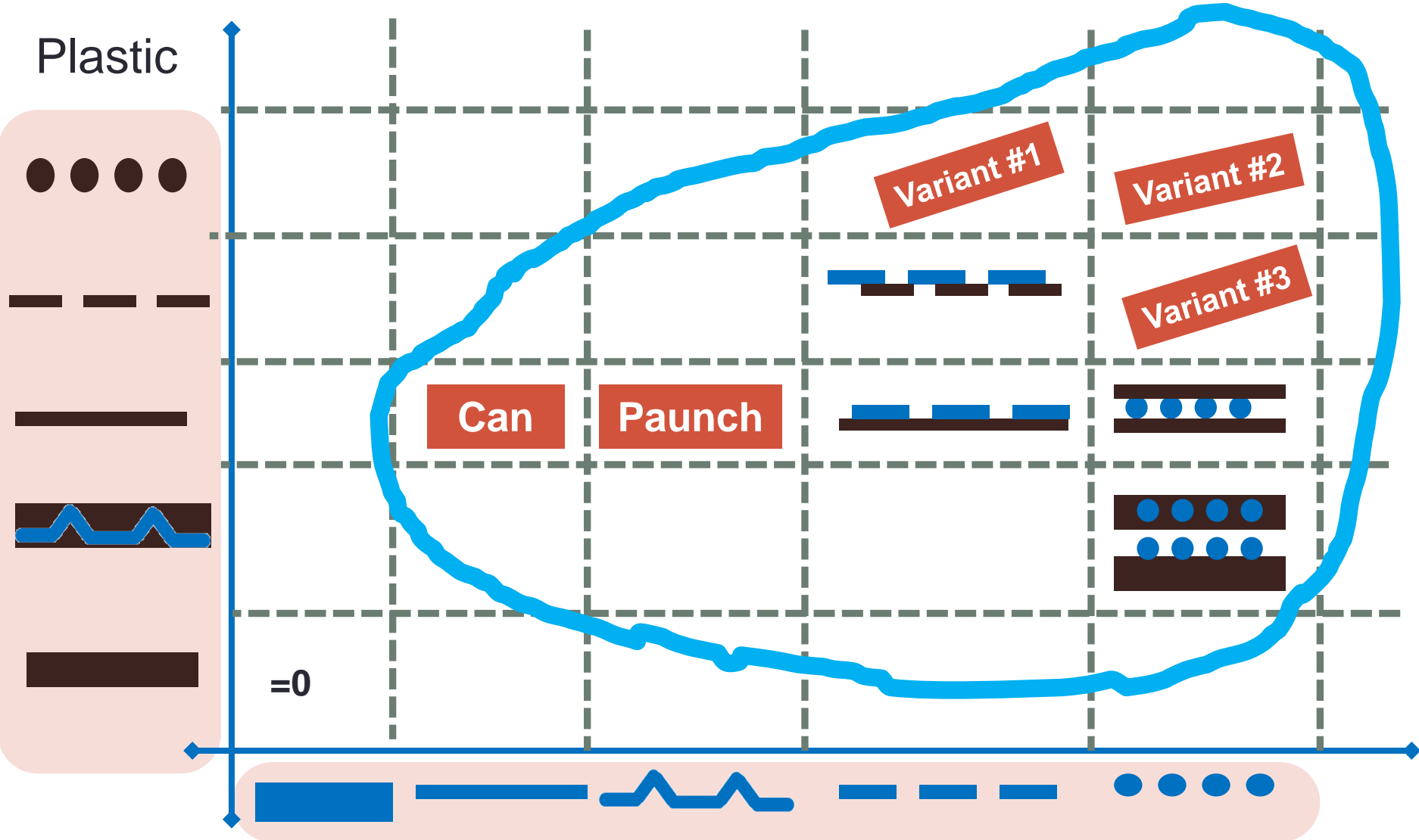
<http://ru.wikibooks.org>



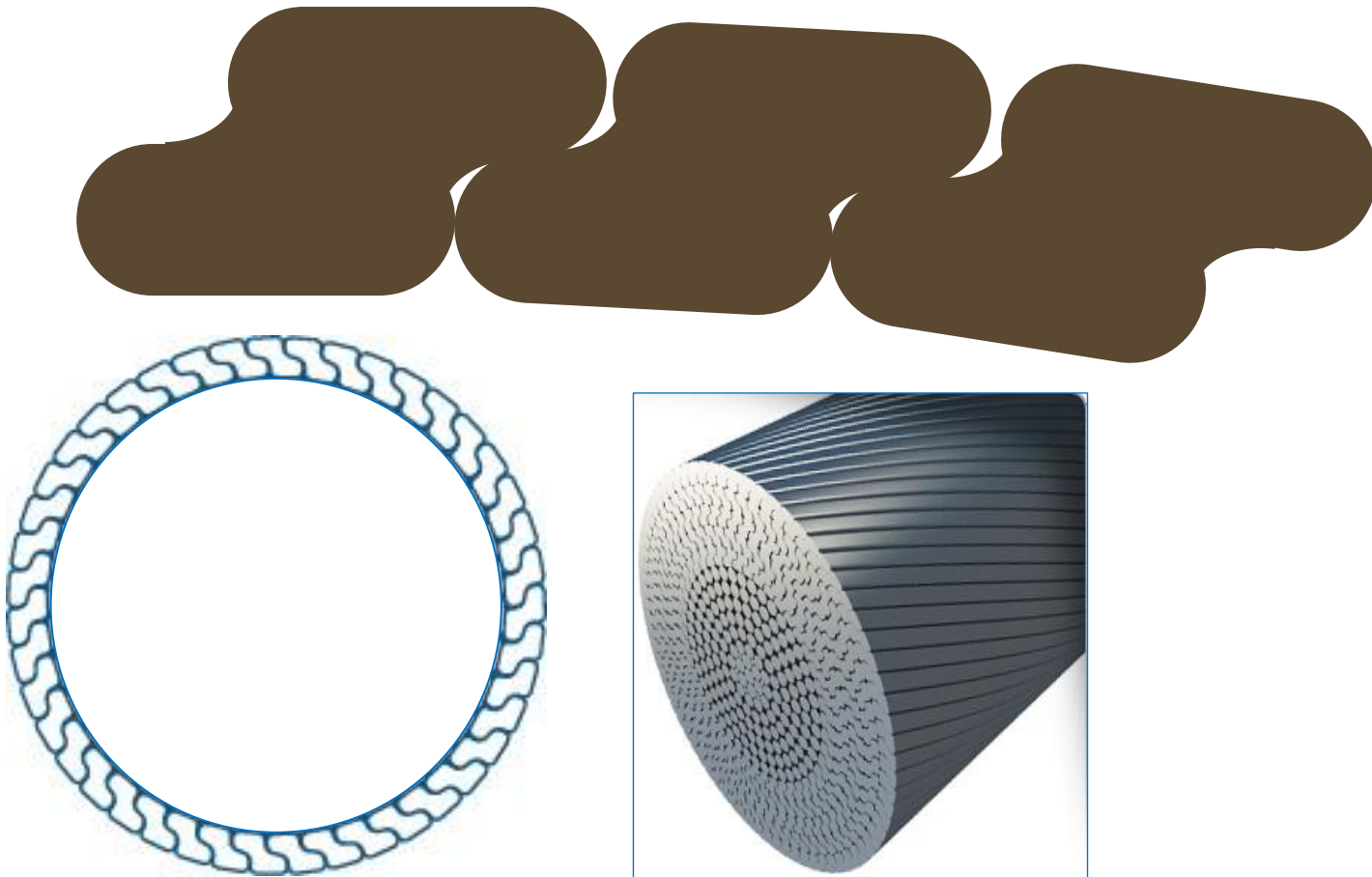
Micro-trend: step-by-step increasing 1-D flexibility



Hybridization : Metal Can & Plastic Wrap

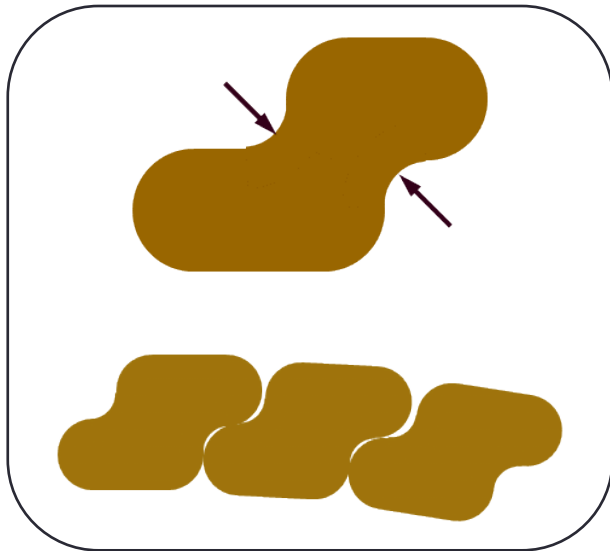


Example 1: Z-shaped battery

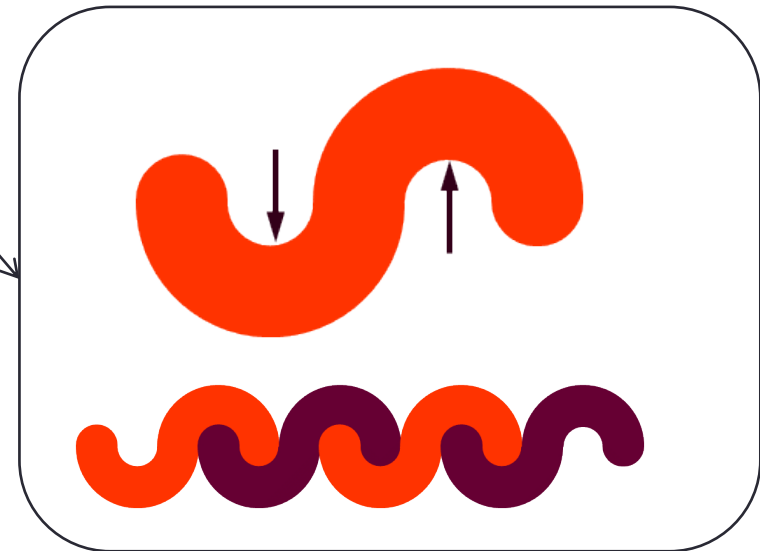
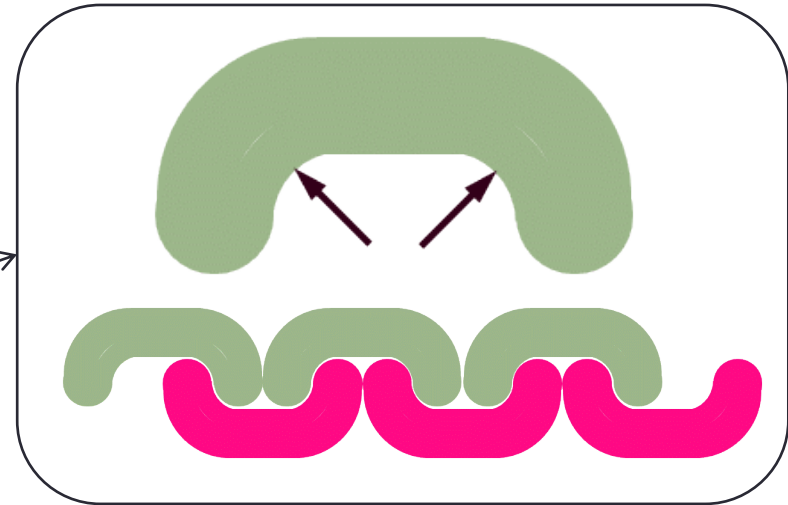


Example 1: Z-shaped battery

Initial idea



Concept expansion

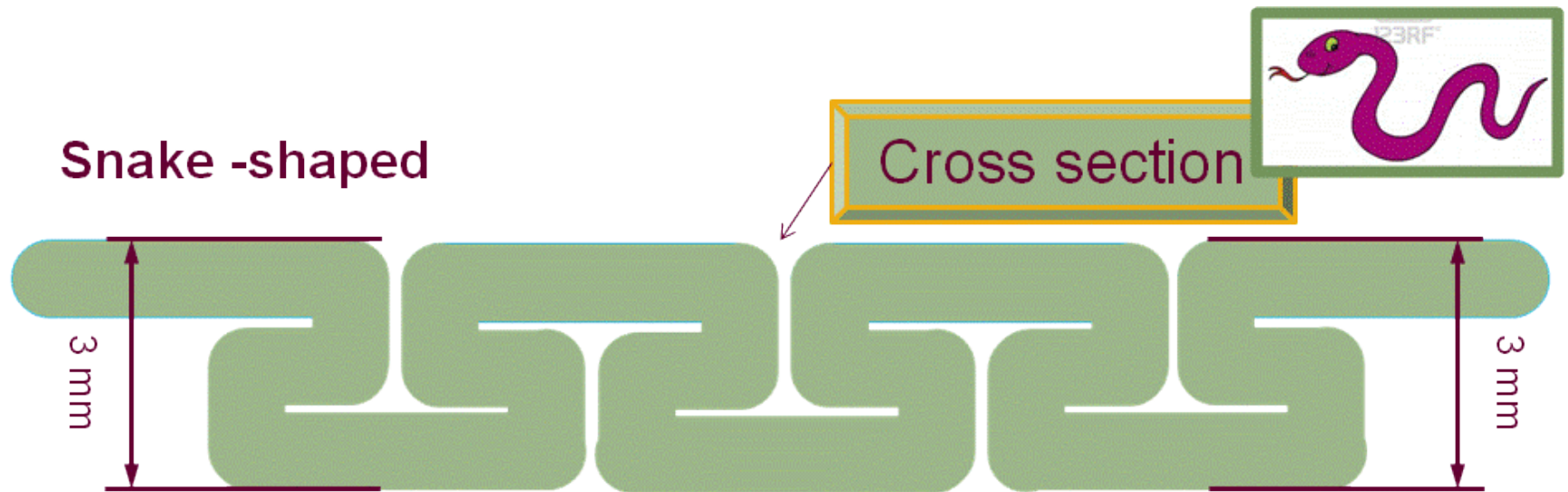


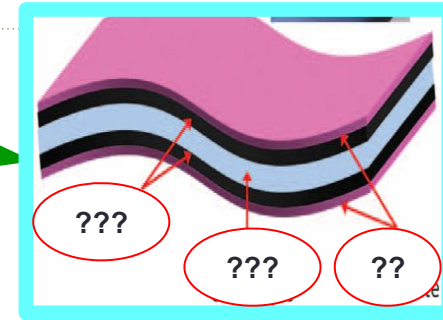
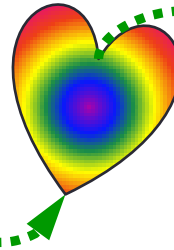
Technology / manufacturing



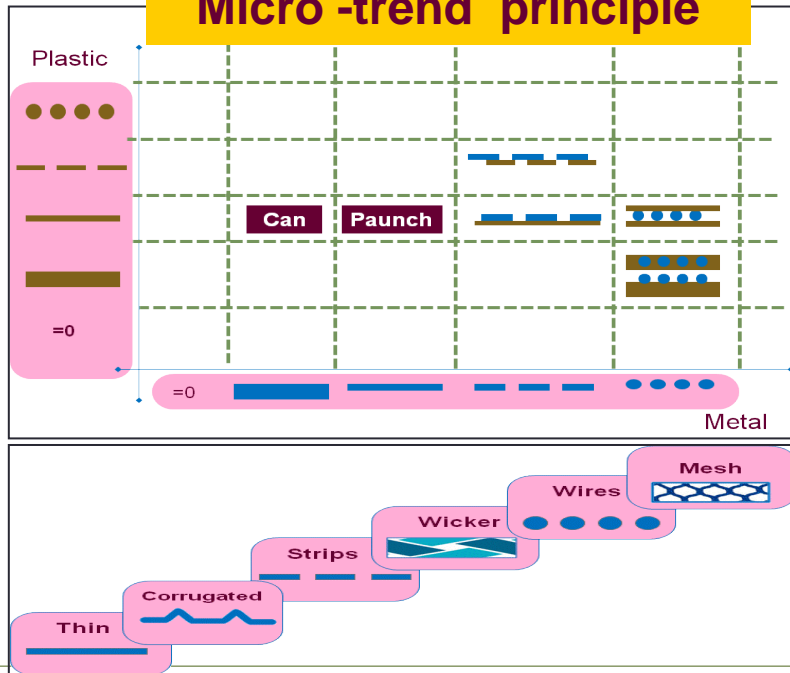
Z-shaped wires

Example 2: snake –shaped battery

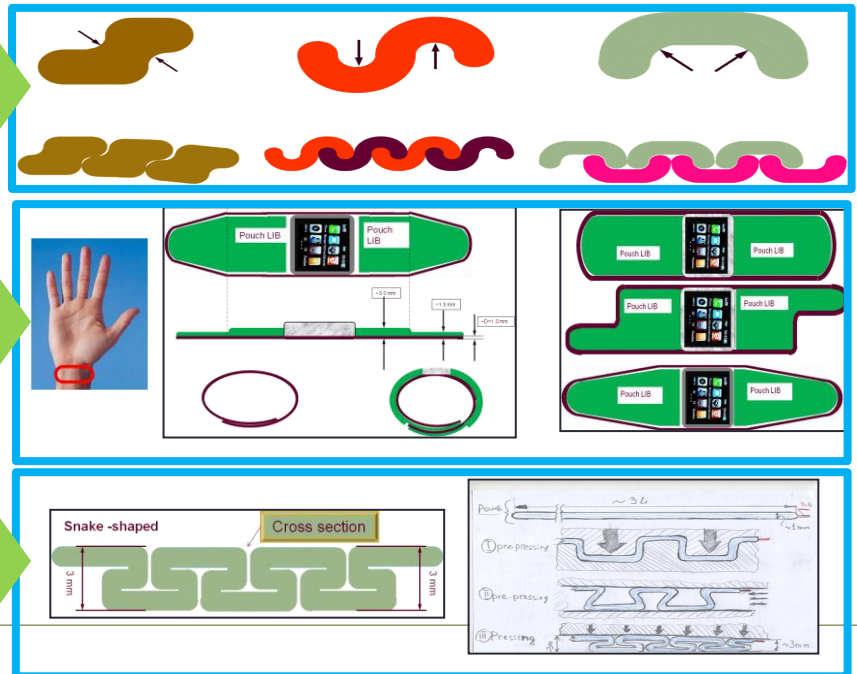




Micro-trend principle



Examples of results



Main outcomes

Micro- trend as addition to classical TRIZ trends is developed

Main merits of this micro –trend is usability for pragmatic applications

Result of practical application → patented conceptual designs (7 patents)



References

1. <http://ru.wikibooks.org>
2. <http://www.cocatalyst.com/blog/index.php/2008/07/25/bmw-gina-concept-demonstrates-triz-law-of-increasing-flexibility/>