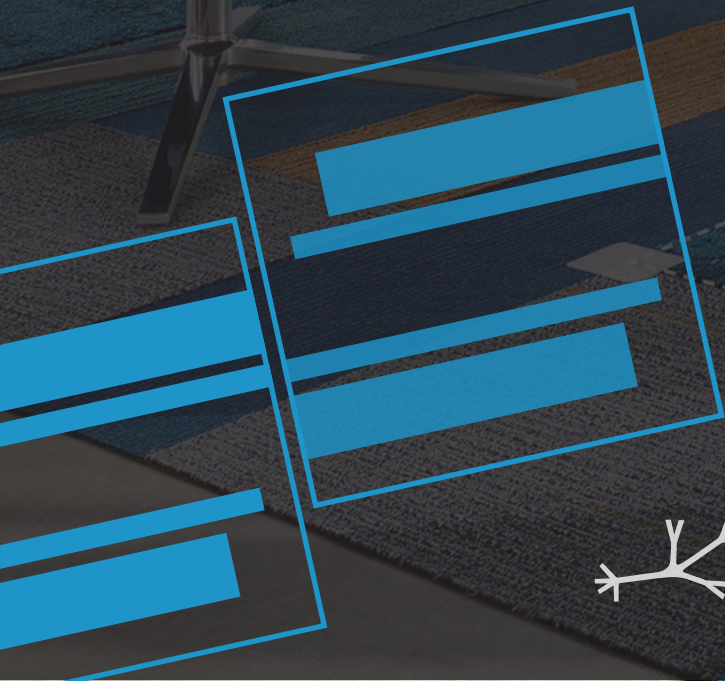


# i2 & TactTiles

BY INTERFACE







**SYNAPSE**

*by Biomimicry 3.8*

# Interface<sup>®</sup>

A BIOMIMICRY CASE STUDY

The commercialization story behind the modular carpet tile that mimics the forest floor to reduce material waste, and more.

Published by Synapse by Biomimicry 3.8  
Written by Biomimicry Business Intelligence



## BIOLOGY

Non-directional pattern of forest floor



Tiny hairs on geckos' feet help maximize contact with surfaces by employing van der Waals forces



Photo © Interface

## DESIGN

Entropy carpet installation



TacTiles adhere carpet tiles to each other as opposed to the floor using van der Waals forces

# Forward

## Biomimicry for Innovative Business Opportunities

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Biomimicry is not itself a product but a process, drawing on strategies observed in natural organisms and practices in order to spark innovation.

*Biomimicry (from **bios**, meaning life, and **mimesis**, meaning to imitate) is a scientific design discipline that seeks sustainable solutions by emulating nature's time-tested patterns and strategies.*

The core idea of Biomimicry is that nature, after 3.8 billion years of research and development, has already developed solutions to many of the problems facing industry, government and agriculture. Such problems include packaging, transportation, energy production, non-toxic chemistry, carbon sequestration, and crop production.

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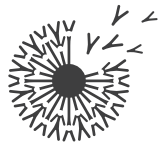




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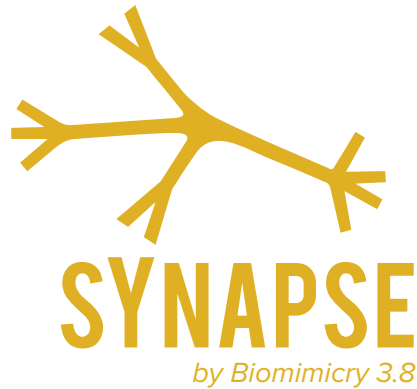
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At Synapse by Biomimicry 3.8, we are dedicated to providing biomimicry intelligence that informs, inspires, and empowers businesses to leverage nature’s genius in solving their own innovation challenges.

By publishing biomimicry case studies that detail the commercialization stories experienced by biomimetic innovators, we hope to expose key insights and lessons learned about getting the most value out of the biomimicry approach as evidenced by real world projects so that others are better prepared to take advantage of nature’s 3.8 billion years of research and development.

While these case studies are detailed, we have highlighted critical take aways throughout the document to provide at-a-glance learnings about market viability, the competitive landscape, the environmental issues, industry drivers, biomimetic insights, and more. Whether you are browsing or diving deep into the details, this case study will provide strategic insight for your next biomimicry project regardless of sector.



The ability to innovate is a key driver of productivity, competitiveness, and prosperity. Innovation requires entrepreneurs to rethink their strategies and adopt new approaches to their businesses, embracing new technologies and manufacturing opportunities that can be the difference between success and failure in the business world.

Biomimicry innovations are fertile hunting grounds for innovative business opportunities. Due to this immeasurable potential, corporate executives, investors, policymakers, and entrepreneurs across many industries look to this emerging field to drive sustainable growth.

But what are some powerful technology trends that can drive company success? What are the important factors that should be considered when trying to identify the next big trend? Biomimicry's inherent value lies in the answers it proposes to these questions.

**BIOMIMICRY ADVISORY SERVICES (BAS)** is an independent financial market research and advisory organization that provides strategic advice and ongoing intelligence on emerging biomimicry technologies. BAS is a project initiative of Biomimicry Switzerland.

## **MISSION**

BAS' mission is to help leaders in the commercial, public, and social sectors develop a deeper understanding of biomimicry innovations and to provide a fact base that contributes to financial decision making on these emerging technologies.



# Executive Summary

From what began as a drive towards sustainability in 1994 and the use of biomimicry as a key sustainable design approach later in the 90's, Interface has taken the concept of modular carpet designs and, by applying the principles of biomimicry, created a company that is leading the green revolution among carpet manufacturers. The patented i2 modular carpet line and the TacTiles glue-free installation system mimic what we can see around us every day in nature. Inspiration from the forest floor has given rise to a carpet revolution that has changed the face of Interface as a company even as Interface is changing the face of the industry.

## SUSTAINABILITY AS INNOVATION DRIVER

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As global warming has been pushed to the forefront of international public opinion, industry has acknowledged the need to adapt to the changing reality of a market that is becoming increasingly aware of global climate issues. Following several market slowdowns and recessions in both 2001-2 and 2008-9, the United States economy looks very different today from what it did 15 years ago, and the carpet industry in the United States has been no exception. Through necessity and innovation, Interface has evolved its business model and its product offering using biomimicry to put it at the cutting edge of sustainable design and production in the carpet industry and position itself as a market leader in green technologies.



Modular carpet design has become pervasive across Interface's product line. The i2 line of products has become the face of the company as it has become the best-selling Interface product. It has opened up large new markets that Interface can capitalize upon, and it has been an industry leader in showing that market innovation is not only possible, but that it is profitable, leading to a larger industry-wide push that has driven many of the other industry leaders to push for greener manufacturing and production techniques. With a reinvigorated focus on the principle of biomimicry, Interface is set to continue as a market leader and a trend-setter in green technology and clean carpet manufacturing well into the twenty-first century.

# Industry Overview

## TIMELINE OF THE CARPET INDUSTRY IN THE US

All of the major players in the U.S. carpet industry are located in Georgia. Over 80% of the world's carpet manufacturing takes place within a 30-mile radius of Dalton, GA.

1950

1960

1970

1980

1990

*Carpet sector was booming in Northwest Georgia, experiencing double digit growth with hundreds of carpet manufacturers springing up in a very short time to claim a share of the growing industry.*

*Carpet manufacturing came to a grinding halt, along with the rest of the United States economy.*

*Major players in the industry, such as Shaw Industries and Mohawk Industries, began to buy out smaller competitors and consolidate the market, giving it the structure it has today: a handful of larger carpet manufacturing firms controlling most of the world's carpet manufacturing capacity.*

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1 Hilton, M. (2015). The Carpet Buyers Handbook.

2 Patton, R. (2006, September 2). A History of the U.S. Carpet Industry (R. Whaples, Ed.).

Retrieved March 31, 2015, from <http://eh.net/encyclopedia/a-history-of-the-u-s-carpet-industry>

# COMPETITIVE & SUSTAINABILITY CHALLENGES

As a whole, the carpet industry is shrinking. Consumers are finding other options, i.e. linoleum, wood, tile, etc., to replace carpet in their homes or places of business. As a result, many companies in the carpet manufacturing sector have begun to expand their product lines to include the manufacture of a broad range of flooring options besides carpet. The carpet industry is also innovating to create eco-friendly, more efficient, and sustainable products and processes that do not require the traditional, petroleum-based carpet manufacturing process that is so hard on the environment and all

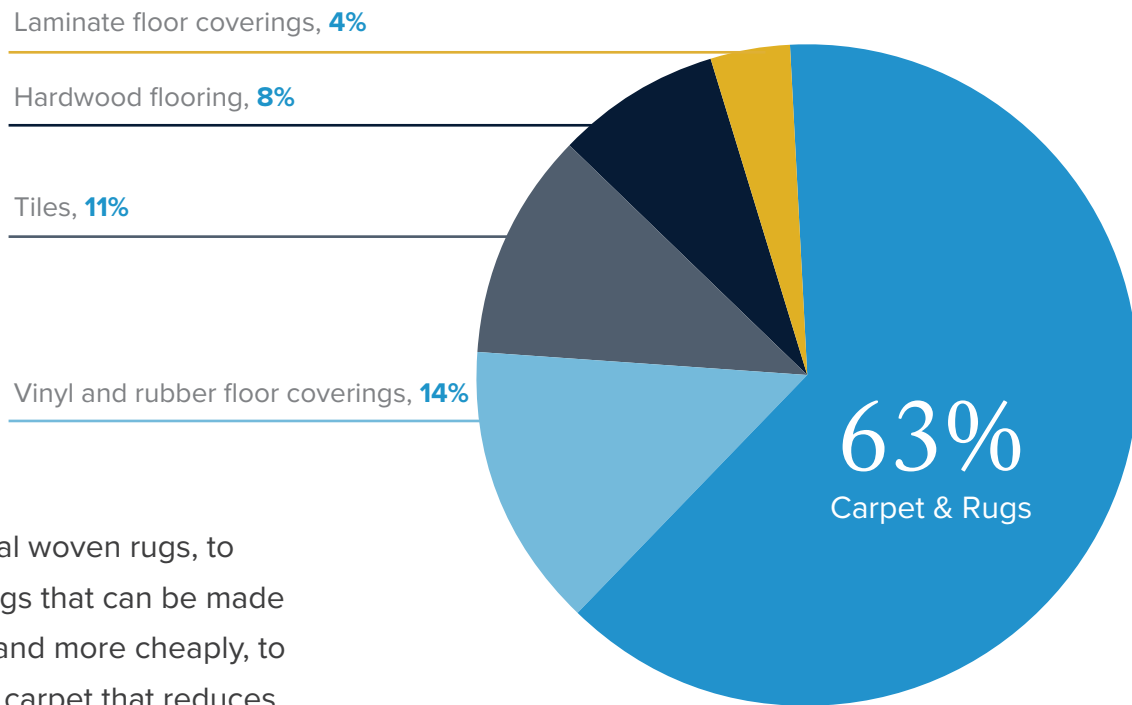
living species, including humans. Traditionally, most carpets are synthetic—nylon, polyester, acrylic—all of which are petroleum-based products and thus not sustainable. Additionally, the synthetic fibers are reinforced by materials such as polypropylene or polyurethane which are also petroleum based, much like the adhesives that are used to secure carpeting to floors. In addition to being unsustainable and non-renewable, these materials tend to off gas volatile organic compounds to which many people are sensitive and can develop a range of symptoms including runny and itchy

eyes, breathing problems, skin reactions, headaches, and so forth. Furthermore, many of the petrochemicals used to make the virgin plastics in carpet are carcinogenic representing a potential hazard to plastic factory workers and nearby communities.

A shrinking market and consumer demand for cleaner alternatives to manufacturing have altered the way the major players in the carpet industry do business. Consumer demand and market trends towards eco-friendly products and processes have led to myriad innovations in the market as well. From the



## INDUSTRY OVERVIEW



**MARKET SHARE OF FLOORING TYPES  
BASED ON TOTAL SALES<sup>3</sup>**

traditional woven rugs, to tufted rugs that can be made quicker and more cheaply, to modular carpet that reduces waste and doesn't require glue, the carpet industry has been constantly innovating over the last forty years to becoming cleaner, greener, sustainable, more cost-effective, and more competitive. Some companies are looking to alternative energy to power their industry while others are moving away from traditional methods of manufacturing carpet to ways to reduce waste and water consumption in the manufacturing and installation processes.

### COMPETITIVE LANDSCAPE

There are other products that affect the industry as a whole because they act as acceptable, albeit imperfect, alternatives to carpet. On the high end, tile and hardwood flooring is available to consumers in lieu of carpet. On the lower end, linoleum

and laminates are available for consumers. As the carpet industry market has shrunk, many of the major players in the industry have started to move into the production of carpet substitutes in order to maintain market share and sales revenue.

<sup>3</sup> <http://www.accuval.net/insights/industryin-sights/detail.php?ID=150>

### Two main products in the carpet industry:



***Rolled carpet** produced through broadloom weaving*



***Modular Carpet** can be customized to a customer's needs.*

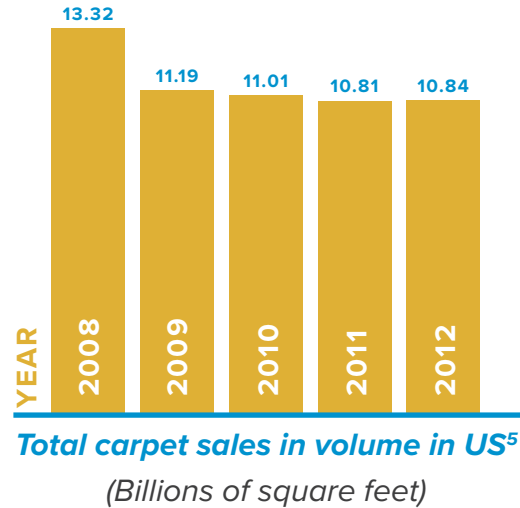
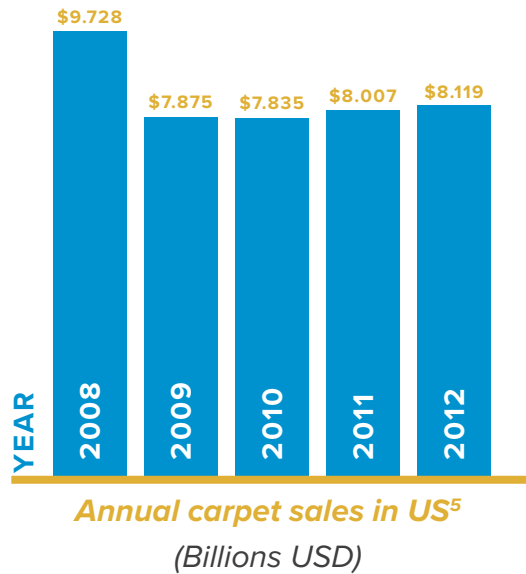
### CARPET PRODUCTION, MATERIALITY, & WASTE

Rolled carpets have a woven backing while carpet tiles will have a more semi-rigid backing. The quality and durability of carpet depends upon multiple factors, such as the thickness of the carpet, or quality and shape of the nylon fiber used in production. Carpet in the United States is largely produced using one of the six main pile fibers: polypropylene, acrylic, polyester, wool, nylon, or cotton. In the U.S. carpet industry, 99% of all carpet produced is made using synthetic fibers<sup>4</sup>.

It is important to notice that in the traditional carpet industry most of these materials are not recycled, reused, or bio-degradable and therefore often end up in landfills for decades. Carpet companies are making a great effort to reduce their raw material consumption, to reduce the amount of waste that goes into landfills from their factories, and to find feasible ways to recycle and reuse what waste they do produce. **In general, the carpet industry understands the need for sustainability.**

In the manufacturing process, carpet is first produced by being woven or tufted into rolls or in sheets. The carpet fiber, if post-dyed, is then dyed using one of three methods: beck dyeing (the most expensive method) in which the woven pattern is submerged in a dye mixture, continuous dyeing (the most cost effective manufacturing method) in which spray jets are used to spray dye on the carpet as it runs in sheets underneath, and print dyeing, which is the method used for all multicolored prints or patterned carpets. Carpets can also be made using pre-dyed fibers as well.<sup>3</sup>

## INDUSTRY OVERVIEW



### RESIDENTIAL VS. COMMERCIAL MARKET SEGMENTS

The carpet industry is subdivided into two main segments: residential and commercial. In the residential market, rolled (“broadloom”) carpet is still the standard and accounts for the bulk of residential market sales. In the commercial market, customers have begun to shift

more towards modular carpet because of heavy traffic flows in commercial areas and the ease and cost effectiveness of selectively replacing worn tiles. Even though the carpet industry as a whole has been shrinking, the carpet tile segment specifically has been growing.

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4 Hilton, M. (2015). The Carpet Buyers Handbook.



## *Interface's Biomimetic Principles for Sustainability*

*The Eco Dream Team's approach to sustainability problem solving was to follow three fundamental principles that govern natural processes.*

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### **Waste equals food.**

An ecological model of commerce implies that all waste has value in other production processes which implies that everything can be reclaimed, reused, or recycled. Understanding this principle led to huge breakthroughs in water conservation and recycling capacity.



### **Nature runs off of current solar income.**

The company invested money and effort into securing its energy needs from renewable sources and improving its energy efficiency.



### **Nature depends on diversity, thrives on differences, and perishes in the imbalance of uniformity.**

Using biomimicry, the company was able to come up with a product category, i2, which used the diverse patterns of nature to provide an elegant solution to manufacturing and installation problems.

# Company Overview

**INTERFACE WAS ESTABLISHED IN GEORGIA IN 1973, RIGHT AS THE CARPET INDUSTRY BEGAN TO SLOW DOWN. FORTUNATELY FOR INTERFACE, THEY SURVIVED AS A START-UP IN A DOWN ECONOMY AND CONTINUED TO GROW THROUGHOUT THE 70S AS OFFICES SHIFTED TOWARD MODULAR FURNITURE AND FLOORING SYSTEMS. IN 1983, THE COMPANY WENT PUBLIC AND WAS LISTED IN THE NASDAQ UNDER THE TICKER SYMBOL IFSIA (LATER CHANGED TO “TILE”).**

In 1988, Interface purchased a Dutch company called Heuga. This purchase defined the future of Interface in two ways. First, Heuga was the inventor of the carpet tile, which became important in defining the future market position of Interface. Second, the purchase of Heuga helped Interface become a much more global brand.

Currently, Interface is a global company that derives approximately 49% of its sales in the United States. Interface competes in the commercial arena as a manufacturer of carpet tile, but they also have a successful residential product line. Interface focuses mostly on commercial where traditional broadloom carpets

are becoming less and less common because of lack of durability and difficulty in replacement. Interface’s residential business, FLOR, offers home and small business customers the ability to create unique, eco-friendly area rugs, runners & wall-to-wall designs.



RAY ANDERSON

## ECO DREAM TEAM

In August 1994, Interface set for itself the goal of becoming the world's first sustainable carpet company. This was the consequence of a vision that the company's owner, Ray Anderson, had after reading *The Ecology of Commerce* by Paul Hawken. In his book, Hawken says that businesses that want to become more sustainable and eco-friendly will have to face three basic issues: what it takes, what it makes, and what it wastes.

After reading *The Ecology of Commerce*, Anderson went back to his company and created the 'eco dream team' whose goal was to address and solve these three basic

sustainability issues without compromising the future of his company.

At the time Ray decided to set Interface on a path towards sustainability, "doing the right thing" was considered a huge gamble and many business leaders feared the company could go out of business as a consequence. **John Picard**, a well-known environmentalist, was in charge of the formation of the team. The original team included Sierra Club executive director **David Brower**; Buckminster Fuller devotee **Bill Browning**, then with the Rocky Mountain Institute (RMI); community and social activist

**Bernadette Cozart**; author and entrepreneur **Paul Hawken**; **Amory Lovins**, RMI co-founder and chief scientist; **L. Hunter Lovins**, RMI's other co-founder; architect and designer **William McDonough**; **Jonathan Porritt**, co-founder of Forum for the Future; **Daniel Quinn**, author of *Ishmael*; **Karl-Henrik Robèrt**, founder of The Natural Step, a sustainability framework; and **Walter Stahel** a resource efficiency expert.<sup>5</sup> Over time, the team has evolved and additional members would be added over the years, including Biomimicry author **Janine Benyus** in 1999, architect **Robert Fox**, and green chemist **John Warner**.

<sup>5</sup> <https://www.greenbiz.com/article/inside-interfaces-bold-new-mission-achieve-climate-take-back>



JOHN PICARD



DAVID BROWER



BILL BROWNING



BERNADETTE COZART



PAUL HAWKEN



AMORY LOVINS



L. HUNTER LOVINS



WILLIAM MCDONOUGH



JONATHAN PORRITT



DANIEL QUINN



KARL-HENRIK ROBERT



WALTER STAHEL



JANINE BENYUS



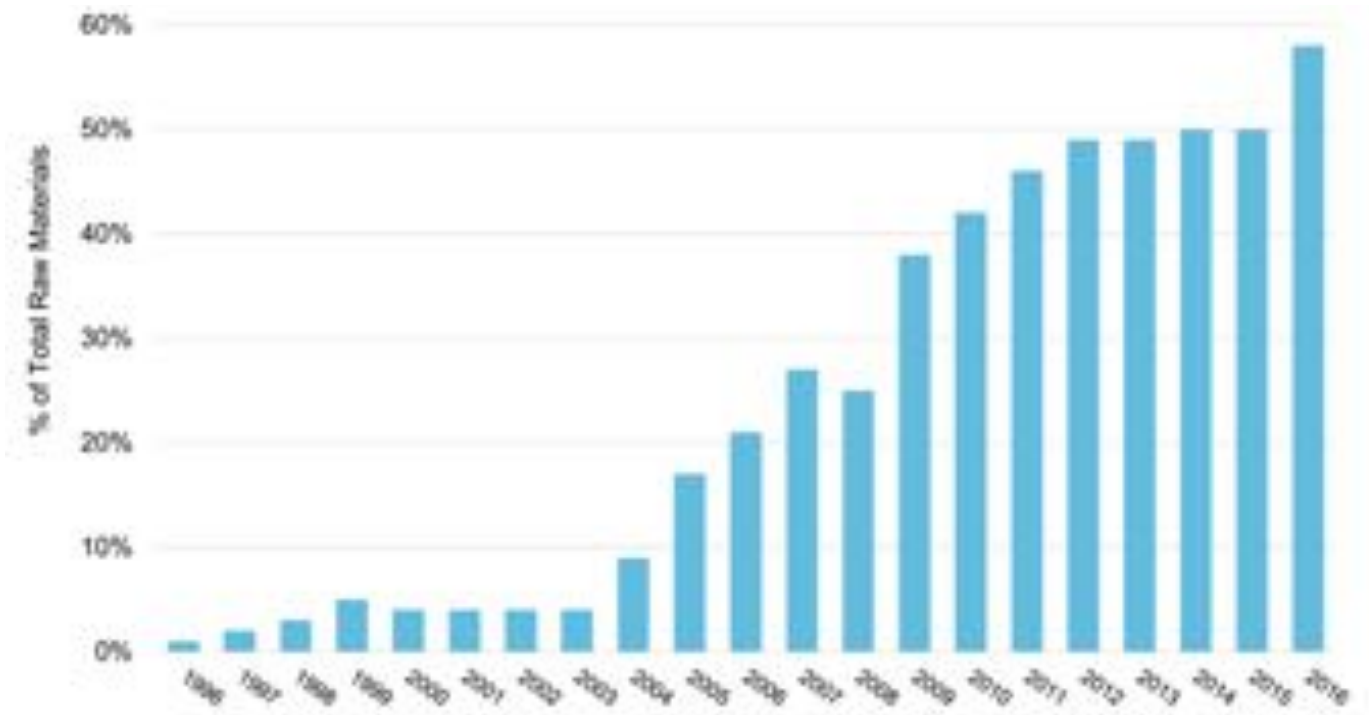
ROBERT FOX



JOHN WARNER

## COMPANY OVERVIEW

With the guiding vision of the Eco Dream Team and the application of the biomimicry principles of sustainability to policy, operations, and design at Interface, reductions in waste and water usage and increases in recycled and biobased materials use were realized by the business.



### CONSOLIDATED RECYCLED & BIOBASED MATERIAL USE<sup>6</sup>

at interface

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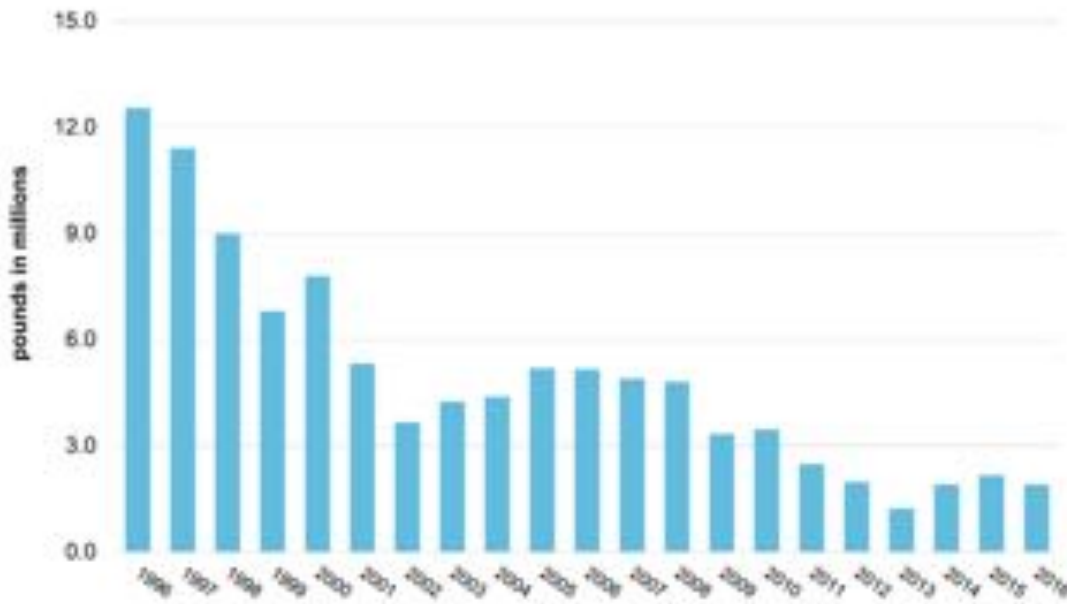
<sup>6</sup> <http://www.interfaceglobal.com/Sustainability/Products/Manufacturing.aspx>



## COMPANY OVERVIEW



CONSOLIDATED WATER USE PER UNIT OF FINISHED PRODUCT<sup>7</sup>  
at interface



CONSOLIDATED WASTE TO LANDFILLS FROM MANUFACTURING SITES<sup>8</sup>  
at interface

7 <http://www.interfaceglobal.com/Sustainability/Products/Manufacturing.aspx>

8 <http://www.interfaceglobal.com/Sustainability/Environmental-Footprint/Waste.aspx>



*Over the past twenty years, Interface has been able to apply biomimicry thinking in product development to commercialize innovative carpeting solutions. This has allowed Interface to set themselves apart from their competitors and get closer and closer to the goal of becoming the first completely sustainable carpet company in the world. Two examples are the **i2 carpet tile line** and **TacTiles Connectors**.*

# DEVELOPMENT OF THE i2 CARPET TILE

In early production of carpet tiles, each tile needed to be produced in perfectly identical symmetrical repeating patterns so that they would have continuity when installed. Every tile that was not identical could not be used and was considered as waste, which was extremely costly for companies. It was costly for the customer who would be forced to purchase excess tiles so that any tiles that were unusually worn or ruined could be replaced, and

costly for the company which had to carry excess inventory. Because of the differences in dye lots between manufacturing runs, the exact coloring of a particular run could not be matched in later production runs, therefore it was necessary for a consumer to purchase excess if they wanted to eventually be able to replace only a few tiles of worn carpet without having to replace the entire floor.

This inefficient production method was tackled by Interface's lead designer, David Oakey, when he decided to apply the concept of biomimicry to product development and encouraged Interface to adopt biomimicry as a focus of research and development, which resulted in several successful innovations.



**Biomimetic inspiration behind i2** | When you look at the forest floor in the middle of autumn, the foliage that covers the forest floor is stunning and beautiful in its erratic array of colors. When viewed closely in sections, each section is noticeably different from other sections, but when viewed as a whole, the colors seem to fade and blend in a coherent and uniform way. It was this idea, coupled with their modular carpet specialization, which has allowed Interface to revolutionize the carpet industry.

# DEVELOPMENT OF TACTILES CONNECTORS

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**Biomimetic inspiration behind TacTiles Connectors** | Turning back to the simplicity of why things stay on the forest floor, Interface was able to create a product called TacTiles Connectors, which is a one-sided adhesive tab that bind the carpet tiles together; their collective weight leverages gravity to hold the tiles to the floor instead of requiring that liquid glue be applied to affix the carpet to the floor.



Interface manufacturing facility in Minto, Australia. Photo © Interface

# Commercialization

## Process & Strategy

**INTERFACE'S BIOMIMICRY-DRIVEN INNOVATION HAS FORCED THE COMPANY TO EVOLVE, AND THIS EVOLUTION HAS TRANSFORMED INTERFACE INTO A COMPLETELY DIFFERENT COMPANY FROM THE ONE THAT WAS ESTABLISHED OVER 40 YEARS AGO.**

# ZEROING IN ON THE WASTE CHALLENGE

The innovation of carpet tile has drastically changed the carpet industry in the past 25 years. When carpet tiles were first used, each tile needed to be made in a specific repeating pattern that could line up with every other tile produced in a production run. By doing this, the modular carpet, once installed, would act like a broadloom carpet; it would appear that it was continuous even though it was not. This gave tiled carpet a huge advantage over broadloom because it could be selectively replaced when wear and tear required it, it facilitated the easy re-arrangement of modular office furniture as

it allowed wires to be rerun simply and cost-effectively, and it was more easily recycled.

There were still some drawbacks, however, that created issues with carpet tiles. One drawback was the inescapable waste factor. Because of the absolute requirement that carpet tiles be identical in order to be replaceable, manufacturers of carpet tile continued to have waste levels in the 3-4% range, a much better and far more cost-effective level than the traditional 10-20% installation waste experienced with traditional broadloom, but still high enough to be a problem, both for environmental and

financial reasons. Another drawback came in the dyeing of the product. Dye in every lot, even though manufactured to be the same color, is a slightly different shade from previous lots used. Therefore, in any production run, even if the exact same pattern and specifications are used in different runs between dye lots, the resulting product will have a slightly different shade than previous production runs because of the subtle differences in dye. Because of this problem, any customer purchasing carpet tiles could not just purchase the quantity of carpet tile needed to replace existing flooring, but

would need to purchase extra carpeting in advance to ensure that they received product from the same production run so that it would match what they were initially installing. Again, this creates excess costs for customers in the form of inventory carrying costs that many customers are not able to incur. It was these inefficiencies in the modular carpet sector that Interface sought to address by turning to biomimicry innovations.

# BIOMIMETIC SOLUTION: EMBRACE PATTERN RANDOMIZATION

Through the biomimetic design process described earlier, Interface was able to create a product that, for the first time, simultaneously solved both the problem of waste in the manufacturing process and the issue of customers being required to incur excess costs in order to ensure modular replacement. The first style created by Interface was called Entropy. Entropy is a carpet that was designed to appear erratic when viewed across separate tiles, but when installed as a whole to have an ebb and flow that appeared both natural and beautiful. This new design substantially reduced waste in the manufacturing process because no longer did each and every carpet tile have to be perfectly identical to all of the others. The Entropy design also had many consumer-friendly advantages to it:

As an installer, the new design was much easier to install. Unlike the old modular carpets, which installation was almost like solving a puzzle ensuring that each side and tile matched up to each adjacent tile, the new Entropy design could be installed in any way, any direction, and would match up to the overall design of the carpet making it a much more user-friendly product.

It increased the lifespan of each individual carpet tile as well because the randomization of each pallet tended to hide wear and tear on the carpet as time went on saving consumers extra money because they don't have to replace the carpet as frequently.

Finally, Entropy also eliminated the need for Interface to store extra carpet in inventory or for customers to purchase excess quantities in advance because the slight variations in color caused by dye lots now fit with the randomized aesthetic.





i2 carpet tiles installed in office environment. Photo © Interface

## A SECOND PHASE OF INTERFACE: i2

Beginning with Entropy, Interface developed an entire platform of modular carpeting called i2. The name “i2” signified a second phase for Interface. This revolutionary carpeting category accounts for approximately

40% the company’s sales in the Americas. Released in 2000, Entropy is still one of the top five best selling Interface carpet styles in the Americas. An astounding six of the top ten best-selling styles in 2012 were i2, and four of these six i2

products occupy the top four spots in the ranking. Considering that Interface offers over a three hundred product styles, the emergence of the i2 platform has completely altered the face of the company over the past decade and a half.

# PUSHING AHEAD THROUGH FINANCIAL TURMOIL

In 2002, the company nearly went bankrupt. The perfect storm combination of the dot-com bubble bursting, residual effects of Y2K, the Asian Financial Crisis, and the terrorist attacks of 9/11 all combined to alter expenditure patterns for the core group of Interface customers, which at the time was almost exclusively corporate clients. The benefit-indisguise of 2002 for Interface was that it allowed the company to refocus around core strengths and to emerge from the crisis even stronger. Starting from an almost exclusive focus on its corporate clientele, Interface leveraged their i2 platform to begin to diversify into the education

market and focus on schools, universities, and other educational institutions. The unique nature of the i2 platform gave Interface a distinct advantage in this market and the sales from non-corporate channels proved sufficient to ensure that Interface was able to survive the downturn.

Since that time, the total percentage of sales to corporate customers has declined from over 90% of total business to just over 50% of total business, while the company has been able to gain a strong foothold in the educational market, now the second highest source of revenue for the company,

while also expanding sales to government, hospitality, healthcare, and institutional customers. Another unique attribute of Interface is that they have evolved almost in reverse of the rest of the industry. As competitors are looking horizontally to expand product lines and product offerings beyond carpet, Interface has been consolidating by shedding non-carpet and broadloom flooring options to focus on their core business of modular carpeting. Today, this focus on Interface's core competence has allowed the company to become the world's largest producer of carpet tile.



## BUILDING ON I2 SUCCESS WITH TACTILES

Photo © Interface

A couple of years after 2002, Interface was again able to take the lead in market innovation by developing the revolutionary TacTiles system. TacTiles are a system that allows the user to eliminate the need for adhesives completely by creating an interlocking pattern of carpet that relies on gravity and the combined

weight of the carpet flooring. TacTiles employ an adhesive that is horizontally strong so the carpet tiles don't separate from each other, but is vertically weak so separate tiles can be easily removed and replaced. Placing the adhesive side face up, four tiles are installed to one TacTile with the four corners touching. TacTiles have

allowed Interface to enter into the residential market where the company had previously had no presence. The simple nature of the TacTiles allows for a DIY model that accounts for 100% of the current residential sales for Interface and over 40% of all installations.

# MAKING THE BIOMIMETIC INNOVATIONS ACCESSIBLE

In the course of its expansion into residential, Interface has set up a web-front business called Flor. Each Flor store is small. Customers can look at carpet samples, talk with a sales expert, and design a rug or floor in the store and then order tiles from the sales associate in the store that arrive in the mail with TacTiles (“Flor Dots”) for DIY installation. Interface currently operates approximately 20 stores in the U.S. based on this model.

Interface employs regional sales associates to call on architecture and design firms and to sell directly to local dealers or end users to increase market penetration. Architects or design firms incorporate carpet specifications directly into their

building plans. Regional sales representatives can also sell direct to corporations or other institutions such as schools, bypassing architects or design firms.

In best-case scenarios, Interface is able to sign exclusive contracts with large corporations, such as Oracle, where the company becomes the sole provider for a company’s carpet installation needs anywhere in the world. In all, Interface sells through sales representatives, intermediaries such as architects, to end-users like institutions, and through dealers, installers, and distributors (i.e. contractors). Throughout the sales cycle, all the relevant parties need to understand and believe in the

innovations that are being sold.

This is the heart of the sales process. Interface has spent a lot of time educating their customers so they understand and appreciate the special products they are buying. End consumers need to know that they are getting the product that is being sold to them: a cost-effective quality product that is easy to install and easy to replace. Contractors and subcontractors need to believe that the product will work as advertised and that displeased customers will not take their business elsewhere to avoid sub-par products; and intermediaries need to be able to envision and incorporate the myriad of styles and varieties that are available to them.



Interface's Net-Works® carpet line uses the non-directional pattern of i2 and is made from ocean plastic. Photo © Interface

## INTELLECTUAL PROPERTY IN AN EVOLVING TECHNOLOGICAL CONTEXT

Beneath all of the innovation that is driving growth at Interface is a series of patents that protect the intellectual property that has been developed to lead this revolution in carpet manufacturing. The i2 platform, as well as the TacTiles technology that was developed and has

allowed the company to gain a toehold in the lucrative residential market that they had previously not been a part of, are both under patent protection. Although patenting provides Interface with a layer of protection, as the company has already successfully fended off

several blatant cases of patent infringement over the years, other companies have been able to enter the market using technology similar to that of TacTiles by developing ways to produce TacTiles that do not infringe upon the company's TacTiles patent.

Constantly shifting trends are perpetually reshaping the industry. New technology has allowed carpet manufacturers to develop styles and designs that they had never before been able to consider. There are new machines that can create carpet tile patterns with completely organic curves and angles. Other machines can now create complex color arrangements and patterns that have not been seen before, such as breaking waves or the patterns of the ocean. Skinny planks (1 meter x 25 centimeters) are currently a trending product in the industry as

well. Each one of these trends brings with them their own accompanying advantages and weaknesses, however. Any tiles that are not cut to a 50 cm x 50 cm specification require special machining to be cut. Carpet tiles with special and more complex patterns are manufactured on new tapestry machines which run much slower than traditional tufting machines because of the complicated patterns that are involved in producing these new carpet designs. Each one of these trends incurs additional costs in terms of labor and overhead to

production and creates a less efficient and more expensive production process overall. To help combat increased costs, Interface has innovated to eliminate all dyeing processes from the factory by sourcing solution-dyed yarn made from colored plastic that arrives in the correct color from the nylon factory.

## MISSION ZERO<sup>9</sup>

In light of the magnitude of the global warming challenge facing our planet, many consumers and advocacy groups are demanding that the traditionally petroleum-based manufacturing of carpet be modified to include more environmentally friendly production practices. Interface has put a lot of effort and resources into revolutionizing the way the carpet industry works. In order to reach their goal of zero negative environmental impact by 2020, the company has focused on areas like renewable energy,

energy efficiency, emissions reductions, waste elimination, certified locations, transportation efficiency initiatives, life cycle assessment, dematerialization, product recovery and recycling, the use of bio-based and recycled materials, educating and supporting suppliers on sustainability, reductions in water use, innovative products, and closed loop process design.

Over the past 20 years, the carpet industry has proven itself extremely efficient at evolving and adapting to changing

circumstances. Interface, with their longstanding goal of becoming the world's first sustainable carpet manufacturing company, has been a leader in much of the innovation in the carpet industry and remains positioned to continue to lead the future.

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<sup>9</sup> [http://www.interface.com/EU/en-GB/about/index/Mission-Zero-en\\_GB](http://www.interface.com/EU/en-GB/about/index/Mission-Zero-en_GB)

Interface has developed a mental model they call **'Mount Sustainability'**, based on the idea that achieving sustainability is difficult, like climbing Mount Everest, but not impossible and infinitely rewarding. The seven fronts of 'Mount Sustainability' are:

- 7 Eliminate Waste:** Eliminate all forms of waste in every area of business.
- 6 Benign Emissions:** Eliminate toxic substances from products, vehicles, & facilities.
- 5 Renewable Energy:** Operate facilities with 100% renewable energy.
- 4 Close The Loop:** Redesign processes and products to close the technical loop through the use of reclaimed and bio-based materials.
- 3 Resource Efficient Transportation:** Transport people and products efficiently to eliminate waste and emissions.
- 2 Sensitize Stakeholders:** Create a culture that uses sustainability principles to improve the lives and livelihoods of all of our stakeholders – employees, partners, suppliers, customers, investors and communities.
- 1 Redesign Commerce:** Create a new business model that demonstrates and supports the value of sustainability-based commerce.



## INGRAINING BIOMIMICRY

Although much of what Interface is today can be attributed to biomimicry, the perception within the company of its “biomimetic” roots has begun to wane. In light of this, the management at Interface has instituted training programs on biomimicry to refresh and teach employees about the important aspects of biomimicry, and to help employees think about sustainability. By asking the question “how does nature perform your task” employees have been given a new way to approach problems and to think out the box when problem solving.

The second application of biomimicry in the company has come in the form of R&D initiatives. Biomimetic processes take a long time to commercialize. First the proper biological model must be found, and then the product must be researched and developed; once the product is developed, more time, effort, and money than normal must be spent on testing and marketing the product because of the uniqueness of biomimetic advancements. Because of the long lead times elapsed from the initial research and development stages to commercialization, Interface

has been building baseline knowledge of biomimicry which will serve as a role model for the next generation of twenty first century companies. Interface is focused on creating a culture where biomimicry is always a part of everything that is done. The company has begun again to look towards biomimicry to drive the future of the company and to remain a market leader in the industry, which as we have seen has worked very well for them in the past.

# Financial Strategy

## Selected financial data (in thousands USD)

YEAR	2014	2013	2012	2011	2010	2009
Net Sales	1,003,903	959,989	932,020	953,045	862,314	859,888
Cost Sales	663,876	618,880	614,841	618,303	549,184	576,871
Operating Income	70,295	95,630	64,648	85,700	93,107	62,994
Continuing operations	24,808	48,255	22,899	38,270	10,297	12,673
Discontinued operations	0	0	-16,956	451	-963	-909
Disposal of discontinued operations	~	~	~	~	~	~
Change in accounting principle	~	~	~	~	~	~
Net Income	24,808	48,255	5,943	38,721	8,283	10,918

2008	2007	2006	2005	2004	2003	2002	2001	2000
1,082,344	No Data	914,659	786,924	881,658	766,494	745,317	875,881	1,017,307
710,299	No Data	603,551	527,647	616,297	543,251	522,119	613,859	699,201
41,659	No Data	99,621	77,716	60,742	31,351	24,889	4,494	69,395
-34,513	No Data	36,235	15,933	6,440	-8,012	-10,605	-21,769	18,875
-5,154	No Data	-24,092	-12,107	-58,815	-16,420	-21,679	-14,518	-1,554
~	No Data	-1,723	-1,935	-3,027	-8,825	~	~	~
~	No Data	~	~	~	~	-55,380	~	~
-40,873	No Data	9,992	1,240	-55,402	-33,257	-87,664	-36,287	17,321

# FINANCIAL PERFORMANCE

From the financial data, we can see that the company is currently performing well and achieving positive yearly net income. In this context, it is important to notice the negative net income from the years 2001-2004. It was during this business downturn that Interface doubled-down on its journey towards sustainability, began market diversification, started shedding underperforming product lines, and focused on core competencies.

From 2005 onwards, with the relatively slight exception of the financial crisis of 2008,

Interface has been generating consistently solid revenue and positive income statements and is poised for substantial growth (at the time of writing), with the first two quarters of 2014 already being the best posted since before the economic meltdown of 2008.

Interface has reached what ecologists call a mature state, which is typical of highly efficient and resource-conserving systems. The company has achieved a state of equilibrium which keeps the business largely unchanged

from year to year. Maintaining equilibrium is especially important for Interface since it will allow them to maintain positive net income in the years to come. Interface is a great example of a company that is doing more with less, just like nature does. By reducing materials, production, and transportation costs, Interface has been able to grow its bottom line year-over-year.

# MARKET PENETRATION

Interface currently has a presence in 110 countries worldwide with manufacturing plants in Georgia, U.S.A., Northern Ireland, The Netherlands, China, Thailand, and Australia. Interface employs 3,800 people across the globe. 49% of sales for Interface occur in the United States. Yearly sales for the company have crossed the one billion dollar threshold, which is still substantially less than many of the company's major competitors in the market. The biomimetic i2 platform, the most popular and best selling module in the

Interface umbrella, reached the \$250 million dollar mark in sales in the United States, and overall sales of the i2 platform account for approximately 20% of total company sales.

Although popular in the United States, it has historically not been as popular a brand in Europe and elsewhere in the world, but the company has begun to achieve new success internationally with the more organic i2 patterns and styles sold using the skinny plank format, as opposed to the more traditional square tiles that tend to dominate the U.S. market.

## INTERFACE'S PRINCIPAL MANUFACTURING FACILITIES AND OTHER PHYSICAL LOCATIONS

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Lagrange, Georgia  
 West Point, Georgia  
 Valley, Alabama  
 Scherpenzeel, the Netherlands  
 Craigavon, N Ireland  
 Minto, Australia  
 Chonburi, Thailand  
 Taicang, China

## THE WALL STREET EFFECT

Although Interface is currently enjoying excellent sales and market leadership in the carpet tile sector, it has underperformed when viewed through the lens of unrealistic growth estimates, particularly as a result of continued economic distress in the EU. This, coupled with inefficient manufacturing processes and out-of-the-ordinary business expenses accrued by a fire in the company's Australia plant, has cost the company some profits in the short run. In the long run however, even this setback has proven

to be an opportunity that Interface has seized upon, in this case to take great strides in corporate social responsibility (CSR). The company ensured that its employees' salaries were paid while the plant was being rebuilt, helping to build goodwill going forward. Because of these issues Interface has been in a situation where profits have not met expectations and according to analysts' estimates, the company was underperforming on the NASDAQ exchange. Through innovation, increasing process

efficiency and the disappearance of extraordinary CAPEX expenditures in 2015, Interface has posted exceptional results in 2015 and investors have taken notice. Investors have been bullish on Interface stock over the first half of 2015, and in July the company reached a new all-time high stock price (Yahoo! Finance) and is rated a strong buy' by financial firms such as Barclays.

Plank-style installation of i2 carpet tiles. Photo © Interface



# Conclusion

Two of the major innovative carpet tile breakthroughs, i2 and TacTiles, that have come to define Interface are a result of the application of biomimicry design processes in innovation. Biomimicry thinking has also allowed the company to achieve great breakthroughs in efficiency and sustainability. This has allowed the company to reduce its impact on the environment, which was the primary objective of Ray Anderson when he decided to start the Mission Zero journey. In the past year Interface has once again begun to turn to biomimicry in R&D and the production process to seek out newer innovations and processes to achieve efficiency and sustainability.

## **New Frontiers in Biomimicry at Interface**

A new application of biomimicry has been used to change the organizational structure of the company. Interface has begun to integrate biomimicry into the daily management of the organization. Some examples of this have been the use of visual cues for teams to know when to switch tasks, cross-training teams to make them able to do more than one task, teaching employees how to self-organize, and introducing new cultural elements of leadership into the organization.

**Factory as a Forest** | The newest biomimetic innovation from Interface that could again change the way people do business is being undertaken at the Interface Australia and Lagrange factories under the direction of Janine Benyus and Biomimicry 3.8 in collaboration with others, called “Factory as a Forest;”, in which the company is attempting to make their factory as ecologically productive as the local ecosystem.<sup>10</sup>

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<sup>10</sup> Factory as a Forest (Interface Australia and Biomimicry 3.8, [www.wired.com/2015/07/janine-benyus-inventing-eco-industrial-age](http://www.wired.com/2015/07/janine-benyus-inventing-eco-industrial-age))



# *Lessons Learned*

## **BE PREPARED TO CREATIVELY ADAPT TO CHANGING CONDITIONS**

Market diversification around a singular, disruptive technology can yield positive financial results. A company must be constantly evolving as the world around it continues to evolve if it hopes to remain at the forefront of its industry and avoid being left behind in the marketplace.

## **STAY THE COURSE**

Sustainable change requires patience, dedication, passion, commitment, and focus from company leadership to the cause. Sustainable biomimetic innovation needs to be made a part of the corporate culture and instilled in all company personnel from top to bottom.

## **INNOVATION CAN DRIVE NECESSITY JUST AS MUCH AS NECESSITY CAN DRIVE INNOVATION**

As the market moves towards eco-friendly, sustainable production processes and products, biomimicry can provide revolutionary, disruptive innovations to support green technology.

*For more information  
about i2, TacTiles,  
and Interface:*  
**Interfaceglobal.com**

*Find a local US sales representative [here](#).  
Global inquiries can be initiated by country [here](#).*

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*BiomimicryBusinessIntelligence.com*

