

The image features a dark grey background with a pattern of teal-colored dots of varying sizes. The dots are arranged in a way that creates a sense of depth and perspective, appearing to recede into the distance. In the center of the image, the word "LUMIA" is written in a light grey, sans-serif font. Above the letter "I" in "LUMIA", there is a small horizontal row of five teal dots, which is a distinctive part of the brand's logo.

LUMIA

LUMIA



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Business

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Visual Communications

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Engineering



Team Forj is a transdisciplinary group in ASU's Innovation Space comprised of students from Engineering, Business, Industrial Design, and Visual Communication Design. With Herman Miller as our sponsor, we looked to discover an innovative solution to reduce the negative outcome occurring from patient falls. Primary and secondary research was conducted throughout the fall of 2009 and conceptualization of Lumia began in the spring of 2010. This book displays all facets of our product.

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PRODUCT CONCEPT

Selected Design Language

Product Aesthetic Benchmarking

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User Experience Storyboard

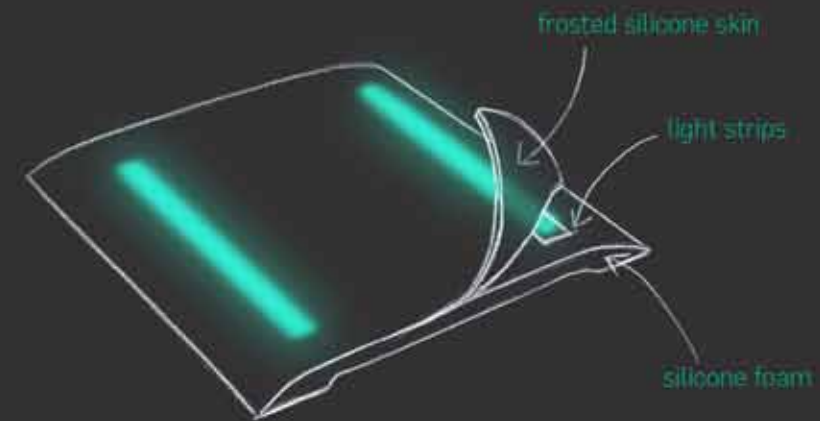
Human Interaction

Exploded View



Selected Design Language

Sophisticated Future



Intelligent and forward thinking, Sophisticated Future is always thinking, "What's next?". Low profile tiles with hydrodynamic-inspired bevels create smooth flowing curves, while thin flexible EL Flat Lights sit just beneath the surface to create a soft glow light source. Silicone foam prevents injury by absorbing shock, and a frosted silicone skin covers the entire surface for a soft, smooth feel and easy cleaning. Inspired by the EL Flat Lights, the color palette consists of blue-green, grey and almost black.

This design language was created to appeal to a large and varied demographic. Modern, futuristic styling makes this protective pathway trendy and aesthetically pleasing which can help erase the stigma of using a safety device.

Personality: intelligent, inviting, futuristic

Form: low profile, smooth flowing curves, rounded corners

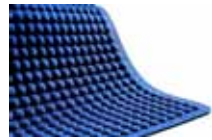
Materials: silicone foam, EL Flat Lites, frosted silicone skin

Colors: blue-green, grey, almost black

Details: flowing lines & edges, smooth soft surfaces, soft-glow lighting

Product aesthetic benchmarking

Anti-fatigue mats/Bedside safety mats/Safety lighting



Product: Air Flex
Personality: Fun, Comfortable
Form: Rounded corner rectangle, dome treads
Material: Nitrite Rubber(20% rec.), Polypropylene
Color: Black, Blue, Brown, Grey

Details: Sizes are 2' x 3' and 3' x 5'
 Thickness - 0.120" throughout body of mat
 Marketed for commercial/office use



Product: GelPro
Personality: Stylish, Trendy
Form: Rounded rectangle, multiple patterned treads
Material: Proprietary Gel
Color: Multiple

Details: Multiple sizes from 18" x 24" up to 36" x 144"
 1" profile
 Marketed for kitchen/home use



Product: WearWell Diamond Plate SpongeCote
Personality: Rugged, Tough, Strong
Form: Rounded rectangle, diamond plate treads
Material: Vinyl, Proprietary Nitricell foam
Color: Grey, Black, Caution yellow

Details: Highly customizable widths, lengths, and shapes
 1" Profile
 Marketed for industrial use



Product: Secure Bedside Tri-Fold Safety Mat
Personality: Intrusive, Boring
Form: Blocky Rectangle
Material: Vinyl, High-Density - High Impact Foam
Color: Black

Details: Sizes - 30" x 66" x 2"
 2" Thick foam, tri-fold design
 Marketed for hospital/nursing home/home use



Product: SpanAmerica Risk Manager
Personality: Intelligent, Technical
Form: Thin, Beveled edge rectangle
Material: Proprietary Elastomeric Gel, Nano Silver
Color: Grey

Details: 1" Profile
 Total Weight = 6lbs
 Rolls easily for storage
 Marketed for hospital/nursing home/home use



Product: Satech Fall Protection Mats
Personality: Intelligent, not showy
Form: Thin, Beveled edge rectangle
Material: Nitrile Rubber
Color: Black

Details: Highly customizable sizes/shapes
 1" profile
 Marketed for hospital/nursing home/home use



Product: Maxxima Night Light
Personality: Modern, Futuristic, Simplistic
Form: Thin Rectangle
Material: ABS
Color: White, Frosted glass

Details: 3 Super Bright White LEDs
 Frosted Lens evenly disperses light without being too bright
 Dusk/Dawn sensor saves energy



Product: Sylvania LED Lighting Kit
Personality: Modern, Futuristic, Sophisticated
Form: Geometric Tubes
Material: ABS
Color: White

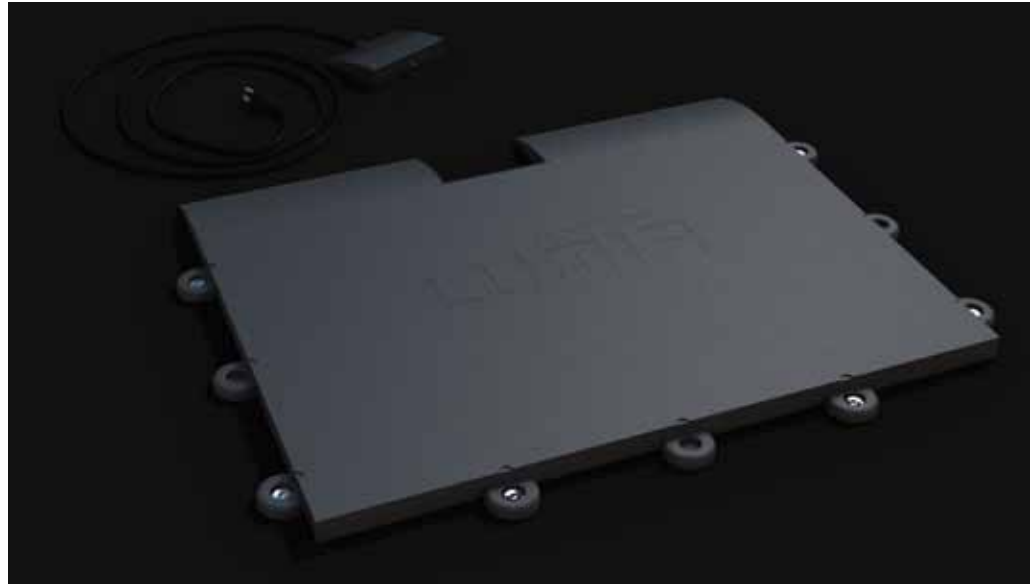
Details: Directional LEDs
 Adhesive backing for easy installation
 Motion sensor turns on light
 Marketed for home use



Product: Surelight Path Light
Personality: Modern, Futuristic, Minimalist
Form: Geometric Strips
Material: ABS
Color: White, Frosted glass

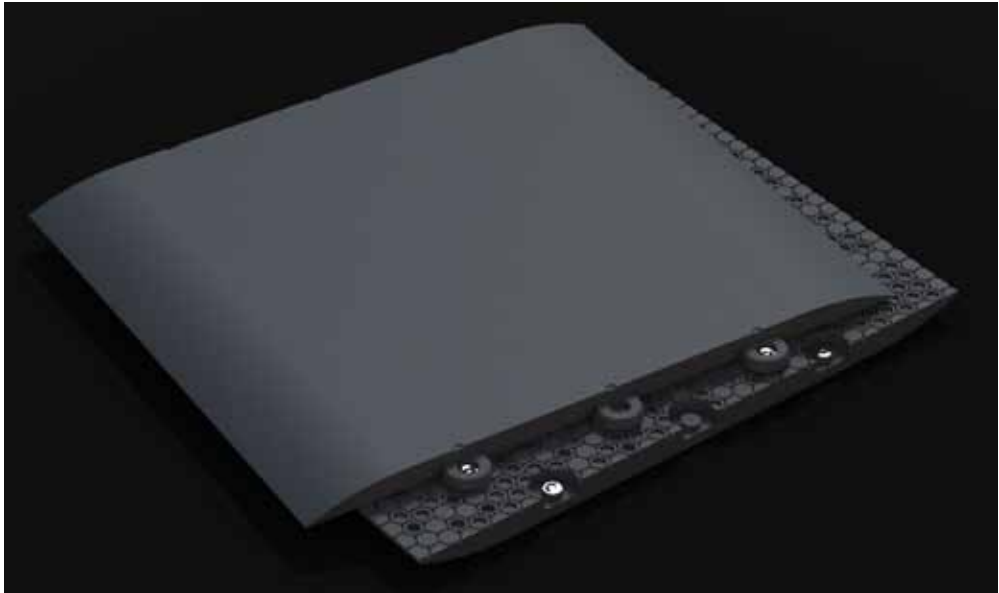
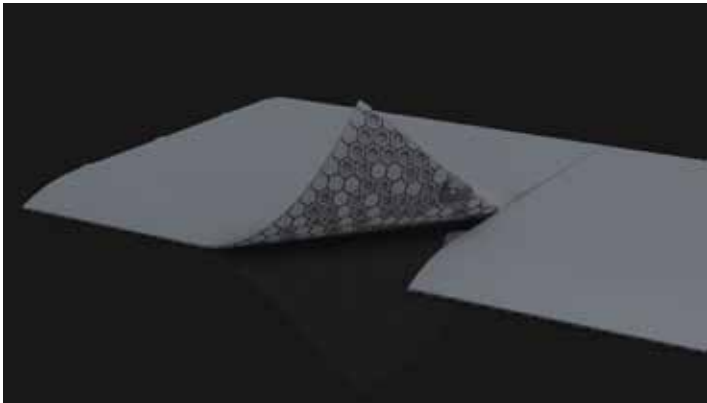
Details: Electroluminescent Light Technology
 Strips can be cut to length
 Integrates seamlessly with existing emergency systems
 Marketed for commercial/industrial use

Final product renderings



Start tile with power box

Tile connectors

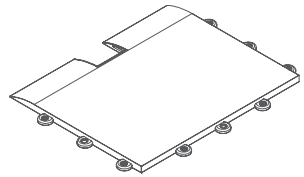


Standard tile

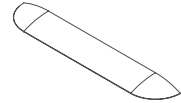
Nurse pager



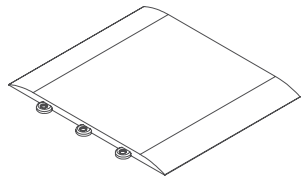
System Parts List



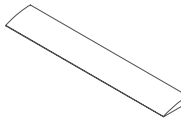
start tile
28"L x 23.5"W x 1"H



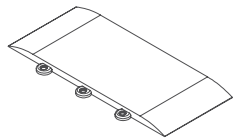
end cap
4.5"L x 28"W x 1"H



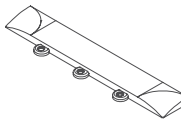
standard tile
24"L x 28"W x 1"H



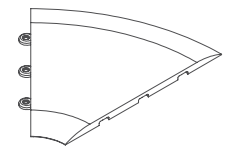
start tile edge cap
4.5"L x 28"W x 1"H



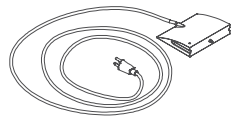
half tile
12"L x 28"W x 1"H



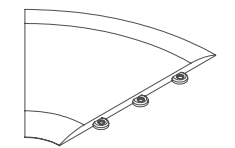
start tile bridge
4.5"L x 28"W x 1"H



left turn tile
28"W x 1"H, 45° left turn



power source
4.25"L x 5"W x 1"H



right turn tile
28"W x 1"H, 45° right turn



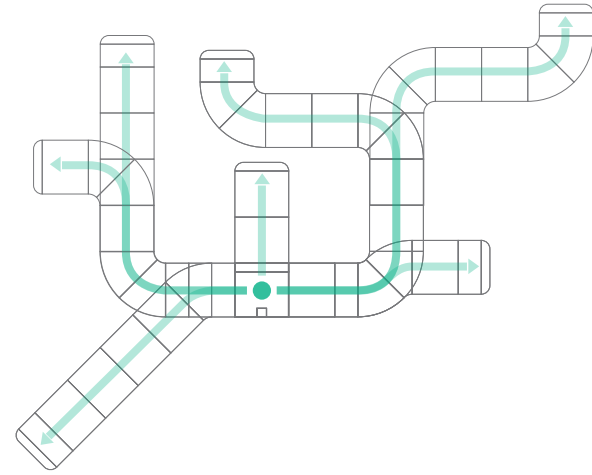
pager
3"H x 2.5"W x 0.5"D

Lumia consists of ten parts that allow for complete modularity to configure to any floor plan. The design creates efficiency through it's ability to minimize materials as well as optimize space.

Features and Functions

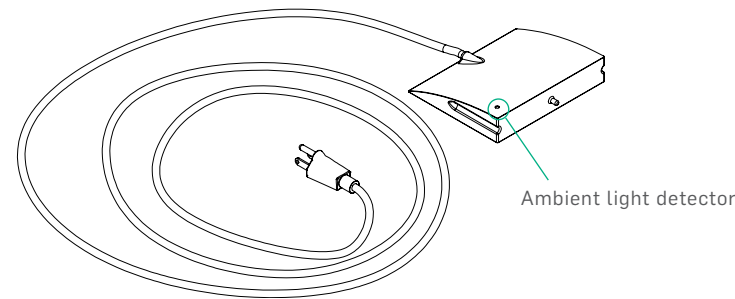
Adaptable

Lumia's modular tiling system creates a wide array of configurations to adapt to any floor plan.



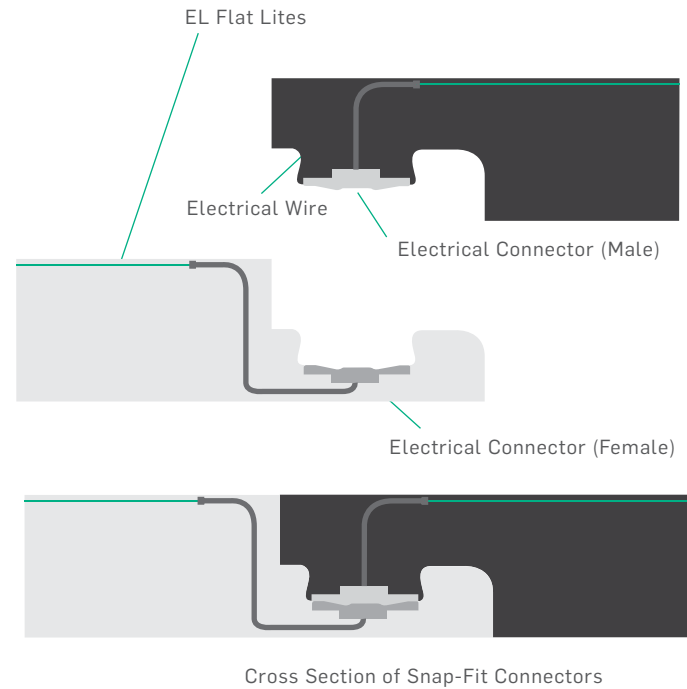
Efficient

To preserve energy, an ambient light detector is built into the power box to prevent Lumia's lighting system from turning on when there is ample lighting in the room.



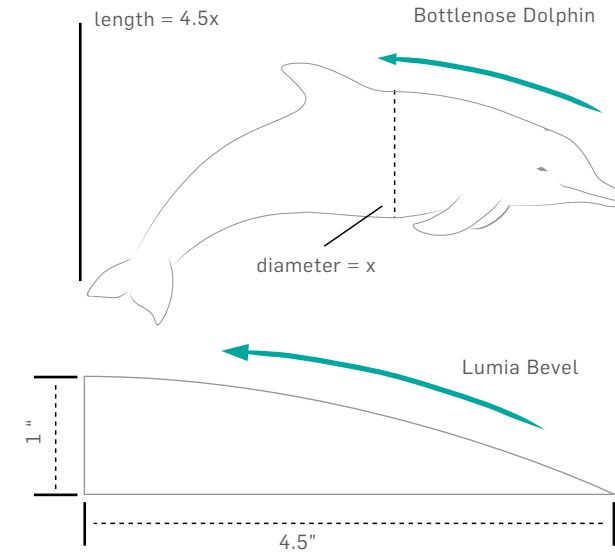
Connected

The Snap-Fit Tab system is designed to physically interlock the tiles as well as provide a platform to distribute electricity throughout the path.



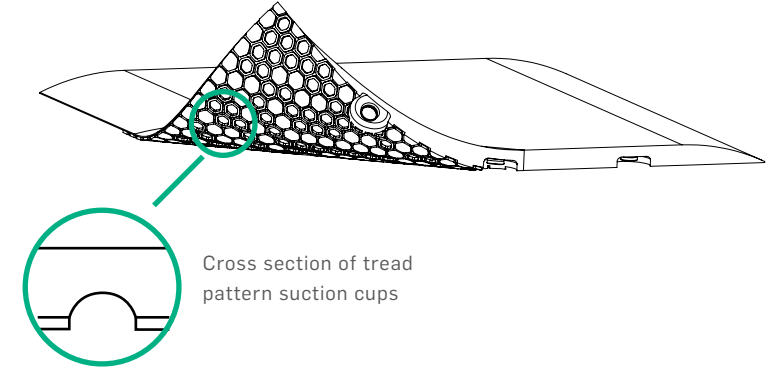
Nature Inspired Design

The curve of the bevels on Lumia's edges are a crucial to help prevent tripping hazards and reduce the amount of force needed to roll equipment over the tiles. The Bottlenose Dolphin served as inspiration to discover this optimal curve because of its streamlined form and low friction coefficient.



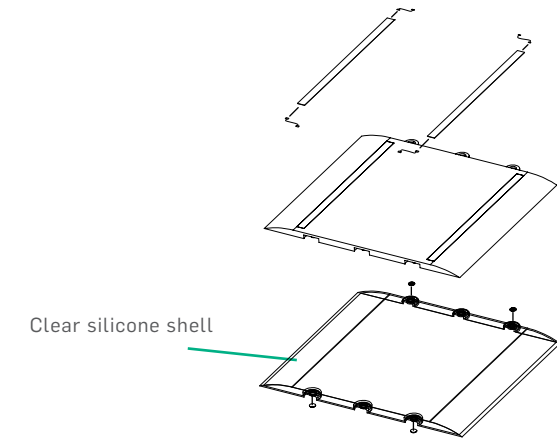
Secure

Lumia's unique tread design keeps the tiles in place without using permanent adhesives. Randomly placed dome forms create a suction effect which hold the tiles in place.



Water Proof

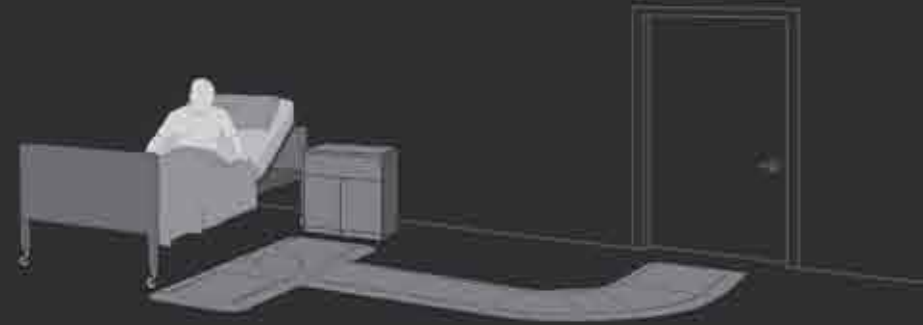
Each tile is completely encased in silicone which protects the electrical wiring, simplifying cleaning.



User experience storyboard

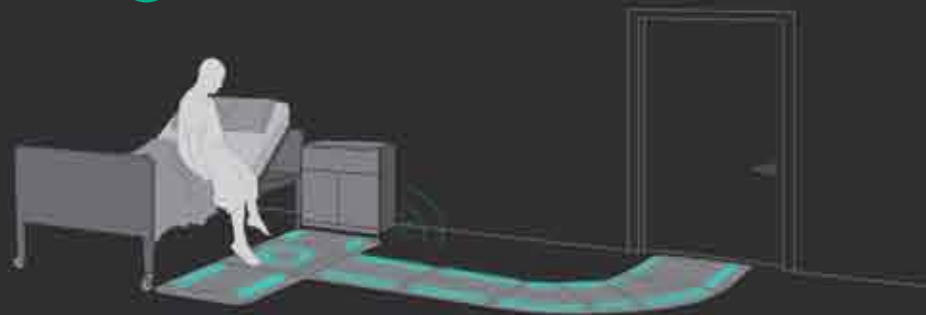
1

Patient wakes up in darkened hospital room, disoriented, and needing to use the bathroom.



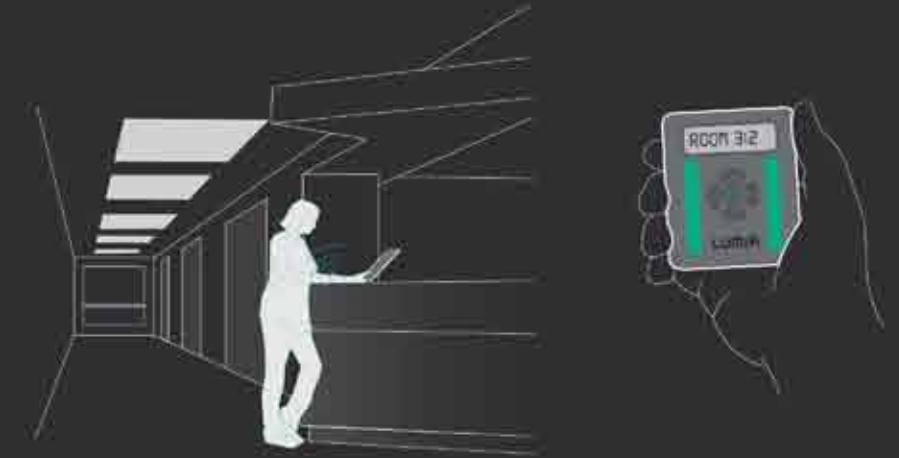
2

One step on the Start Tile activates Lumia's lighting system and simultaneously sends a signal to the nurse's pager indicating the patient is out of bed.



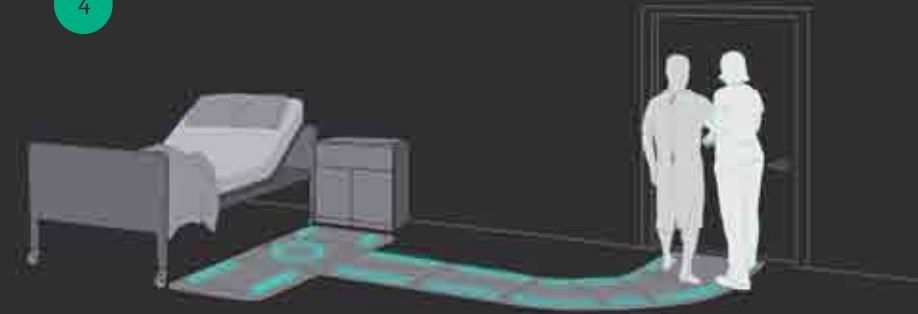
3

Lumia's Notification System alerts the nurse that the system has been activated and also displays the patient's room number.



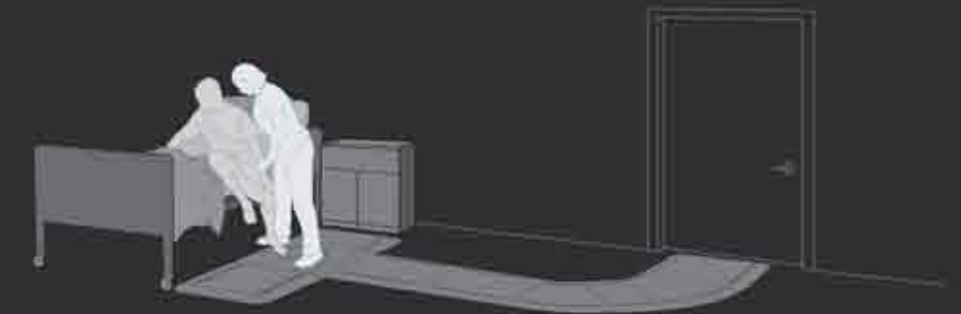
4

The efficiency Lumia's Notification System allows the nurse to arrive promptly to assist the patient.



5

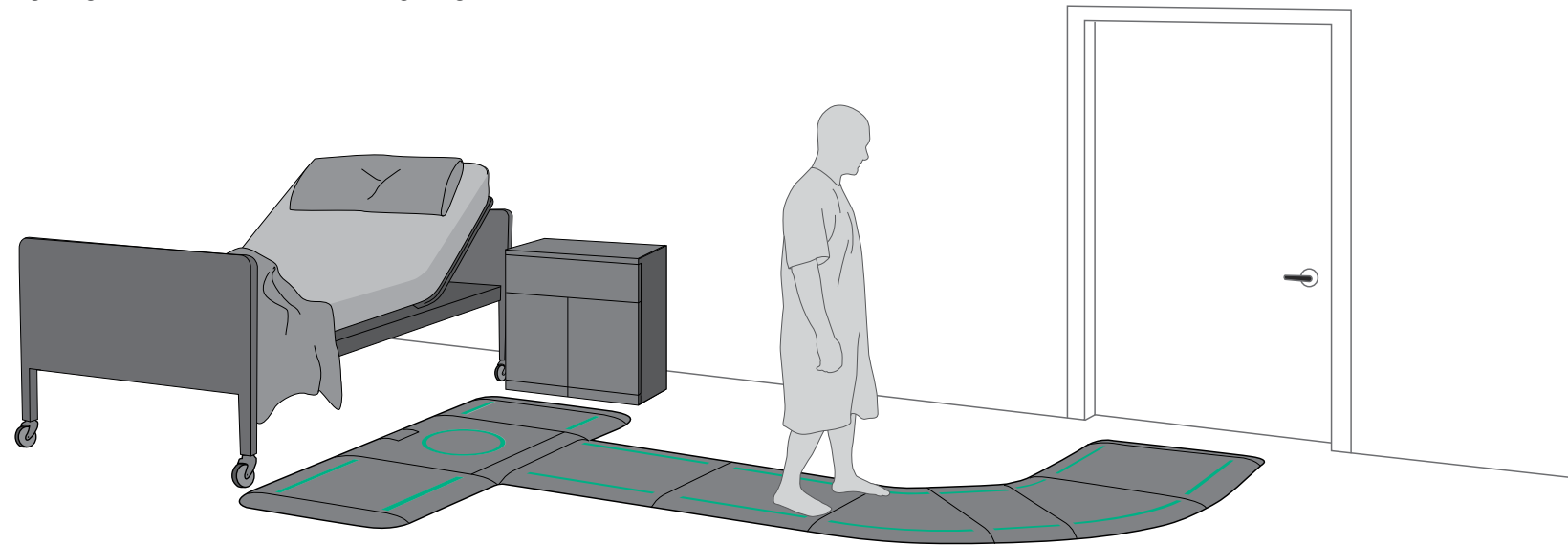
The Lighting System remains on until the Start Tile is reached which then turns off the lighting and resets the notification system to stand-by.



Human Interaction

Patient Interaction

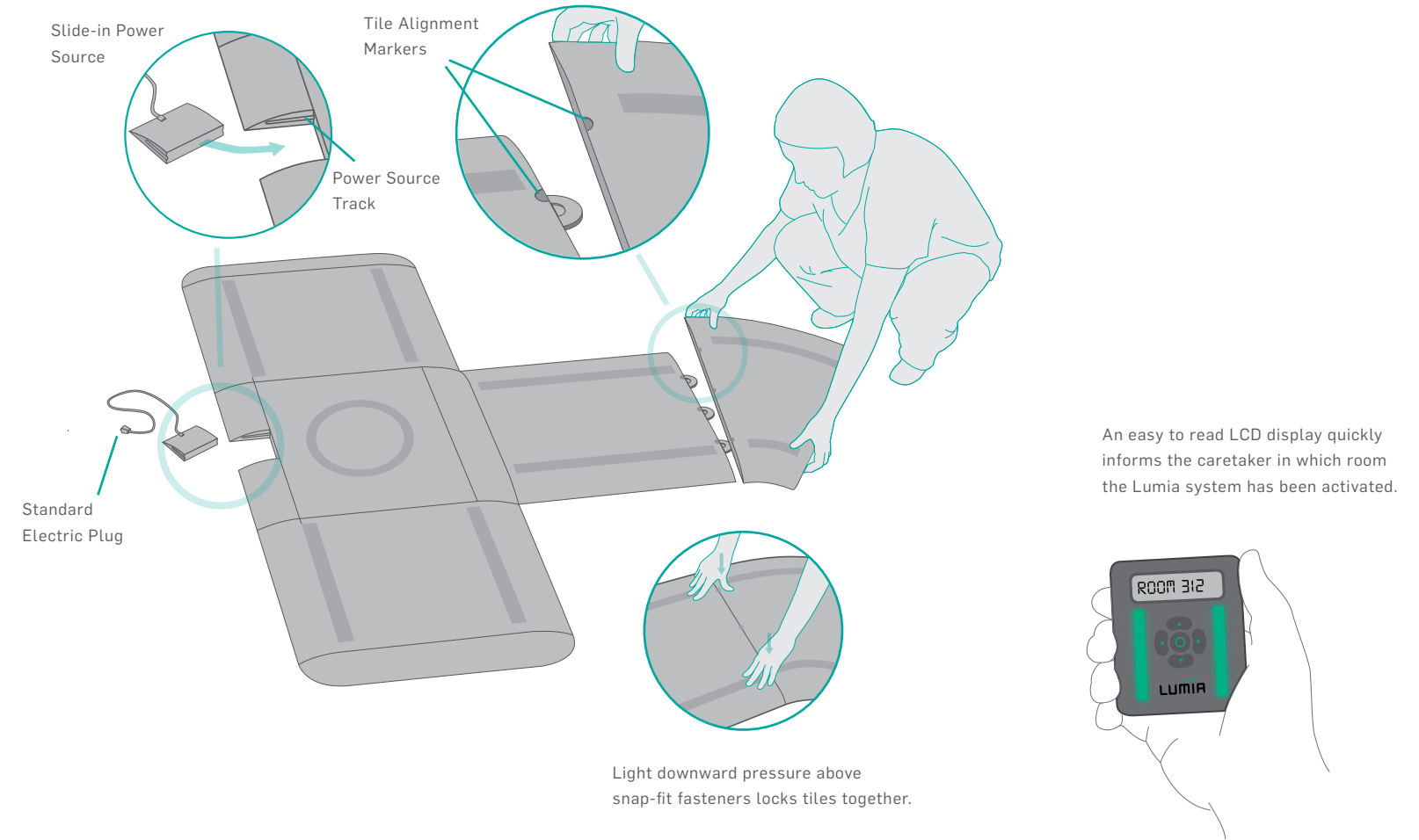
Patient interaction is as simple as stepping on the start tile, which triggers Lumia's safety lighting system. The first touch turns the lighting on, the second, turns the lighting off.



Smooth silicone coated tiles comfort the feet.

Soft glow lighting is easier on the eyes compared to the conventional overhead fluorescent lighting.

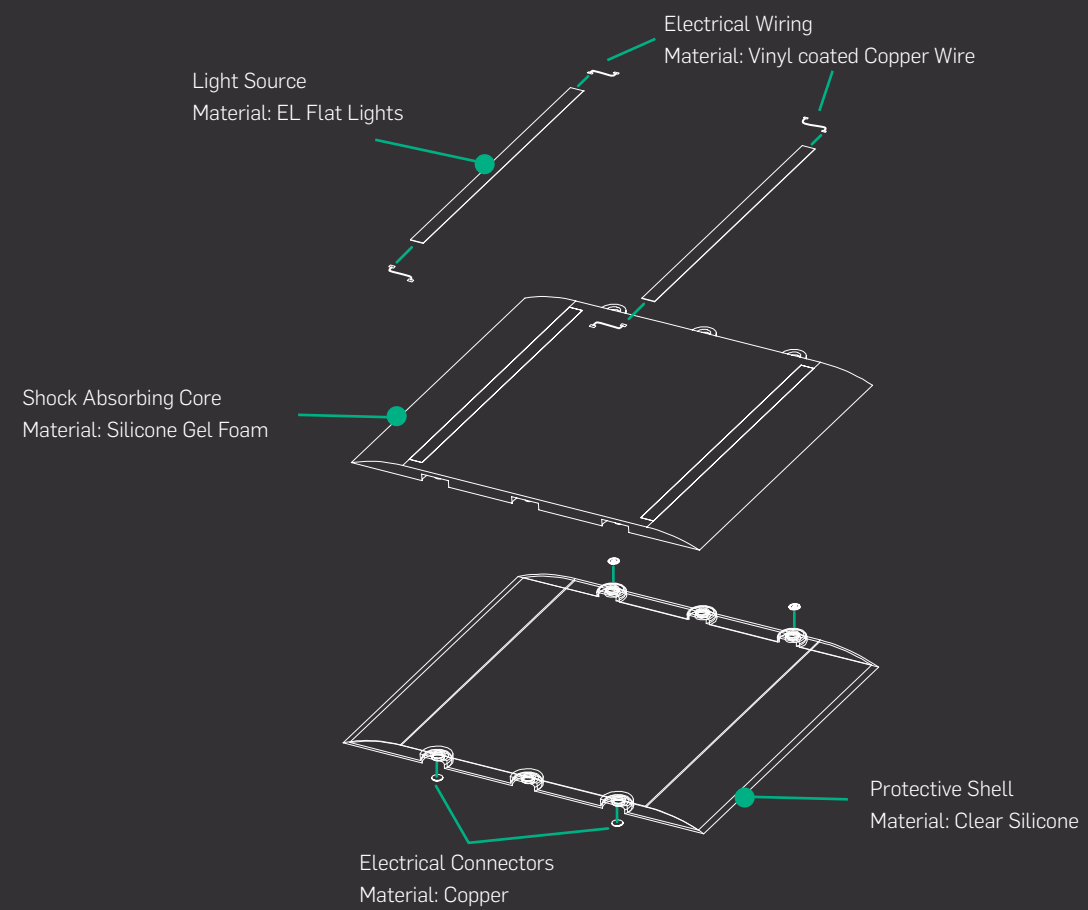
Caretaker Interaction



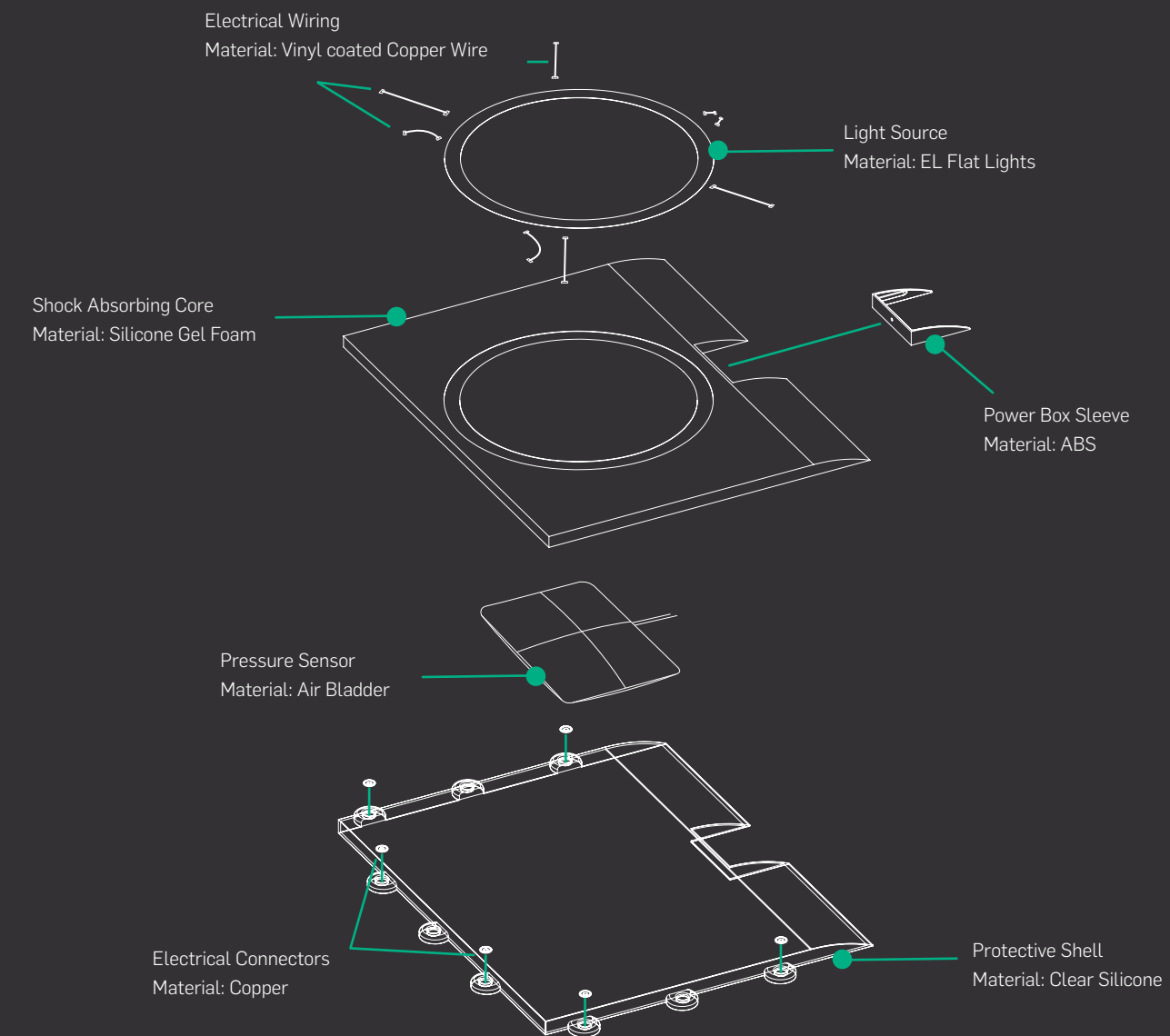
Light downward pressure above snap-fit fasteners locks tiles together.

Exploded view

Standard Tile



Start Tile



BRAND IDENTITY

Brand Design Language

Brand Benchmarking

Key Elements

Brand Guidelines/Typography

Select Media Options

Implementation Timeline

Brand Design Language

Ambience

A sublime and glowing design that conveys a nirvanic feeling. This design draws attention with it's simplistic beauty, yet futuristic approach.

Ambience will appeal to audiences of all ages and create new markets in the future as it progresses.











Brand Guidelines explained
in further detail on pages 27-30



*Example imagery

To differentiate Lumia in the marketplace, it is important to identify the brand characteristics of its competitors. While Lumia as a product is unique in itself, the brand must reflect these qualities.

Brand Benchmark

Logo/Brand	Personality	Color Palette	Typography	Textures
	Organic, fresh		Sans-serif	Cushioned
	Professional, fresh		Serif, simple	Smooth, clean
	Medical, simple		Modern, block	Soft, cushioned
	Professional		Sans-serif, elegant	Smooth, clean shapes
	Simple, professional		Geometric sans-serif, simple	Speckled

"Lumia is a product for hospitals with state of the art technology, which care first and foremost about the patient and their well being."

Positioning Elements

Core Essence: Modern technology that creates an ambient and soothing experience.

Key Features/Benefits: Provides a lighted and padded pathway for hospital patients.

Experiential Elements

Identity experience: Futuristic, soothing, ambience

Website: Easy to use application that allows customer to select amount of tiles they need for specific floor plan.

Customer service: free installation, helpful tech support (no voice recording on phone),

Tradeshows: Full experience of the product and brand.

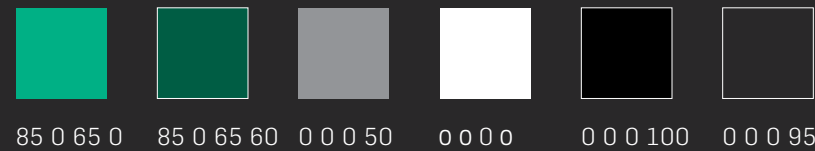
Audience	Message	Channel
Medical Professionals/ Hospital Administrators	<ul style="list-style-type: none"> Saves staff time Advanced technology for patients Increases patients safety 	<ul style="list-style-type: none"> NEO Con World's Fair tradeshow booth Healthcare magazine ads
Patients (hospital or home)	<ul style="list-style-type: none"> Increased nighttime vision/safety Advanced care at home or hospital 	<ul style="list-style-type: none"> TV commercials Ads in hospitals/magazines

Brand Guidelines

The name for Lumia (Loo-mee-uh) is a combination of the words "luminate" and "via", meaning go or way. The logotype was created to give the soft and tile-like appearance of the product itself, with the design element guiding you to your destination.



Color Palette (CMYK)



Typefaces:

Lumia custom

Flama - Light, Book, Basic, Medium, Bold

*see pages 29-30 for typeface information

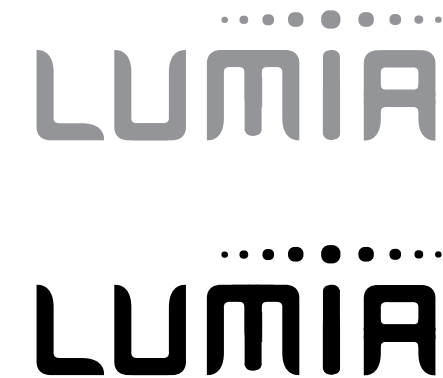
Clear Space

A minimum of 1 x the height of the logotype is the established clear space for the brand. This area should be free of any other graphics, images, or text.



Logo Usage

The logotype for lumia may be printed in color, grayscale, or black. Do not change the typeface or stray from the given color palette.



Typography

Lumia Custom Typeface

A B C D E F G H I

J K L M N O P Q R

S T U V W X Y Z

The Lumia typeface is to be used for headlines and titles only, never in large bodies of text.

Flama Light

Aa Bb Cc Dd Ee Ff Gg Hh Ii Jj Kk
Ll Mm Nn Oo Pp Qq Rr Ss Tt Uu Vv
Ww Xx Yy Zz 0 1 2 3 4 5 6 7 8 9

Flama Book

Aa Bb Cc Dd Ee Ff Gg Hh Ii Jj Kk
Ll Mm Nn Oo Pp Qq Rr Ss Tt Uu Vv
Ww Xx Yy Zz 0 1 2 3 4 5 6 7 8 9

Flama Basic

Aa Bb Cc Dd Ee Ff Gg Hh Ii Jj Kk
Ll Mm Nn Oo Pp Qq Rr Ss Tt Uu Vv
Ww Xx Yy Zz 0 1 2 3 4 5 6 7 8 9

The Flama type family is to be used for all body text, as well as headlines and titles.

Flama Medium

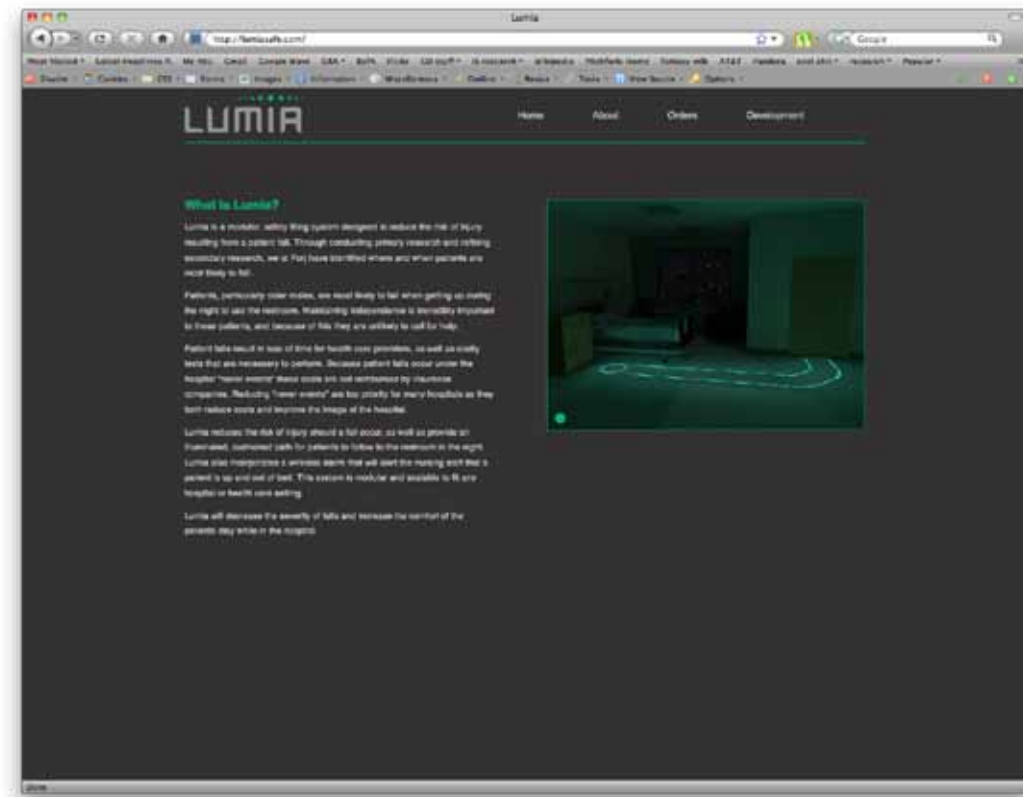
**Aa Bb Cc Dd Ee Ff Gg Hh Ii Jj Kk
Ll Mm Nn Oo Pp Qq Rr Ss Tt Uu Vv
Ww Xx Yy Zz 0 1 2 3 4 5 6 7 8 9**

Flama Bold

**Aa Bb Cc Dd Ee Ff Gg Hh Ii Jj Kk
Ll Mm Nn Oo Pp Qq Rr Ss Tt Uu Vv
Ww Xx Yy Zz 0 1 2 3 4 5 6 7 8 9**

Select media options

www.lumiasafe.com

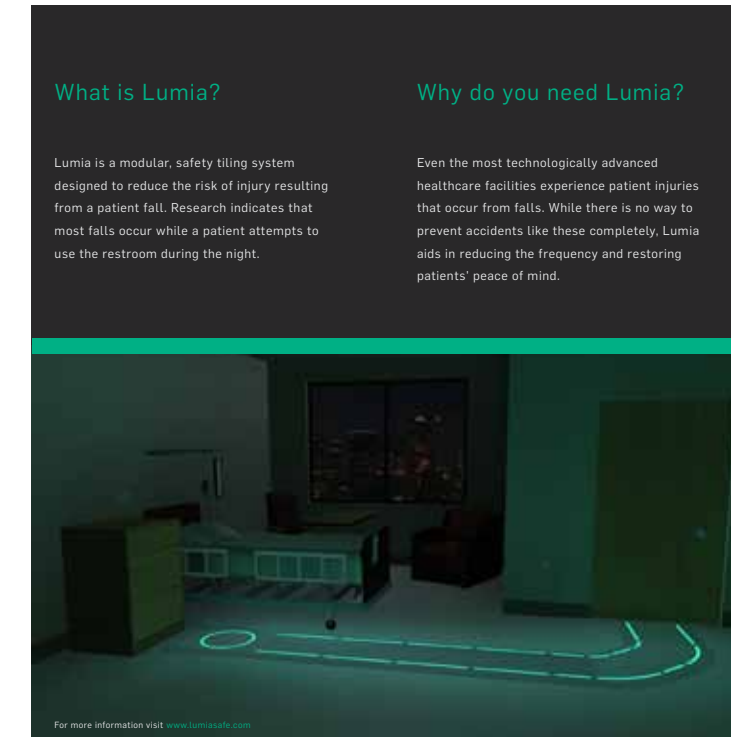


Brochure

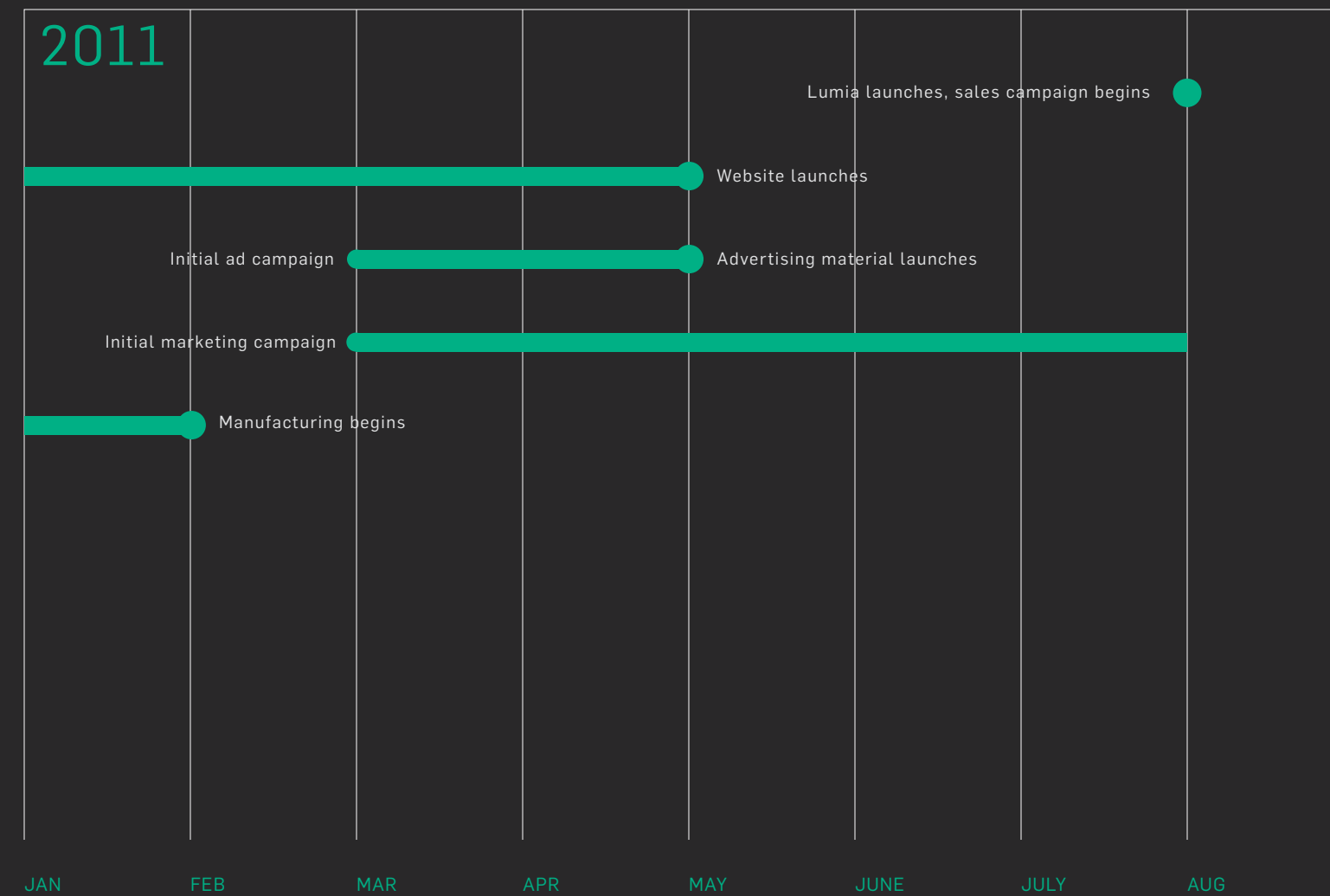
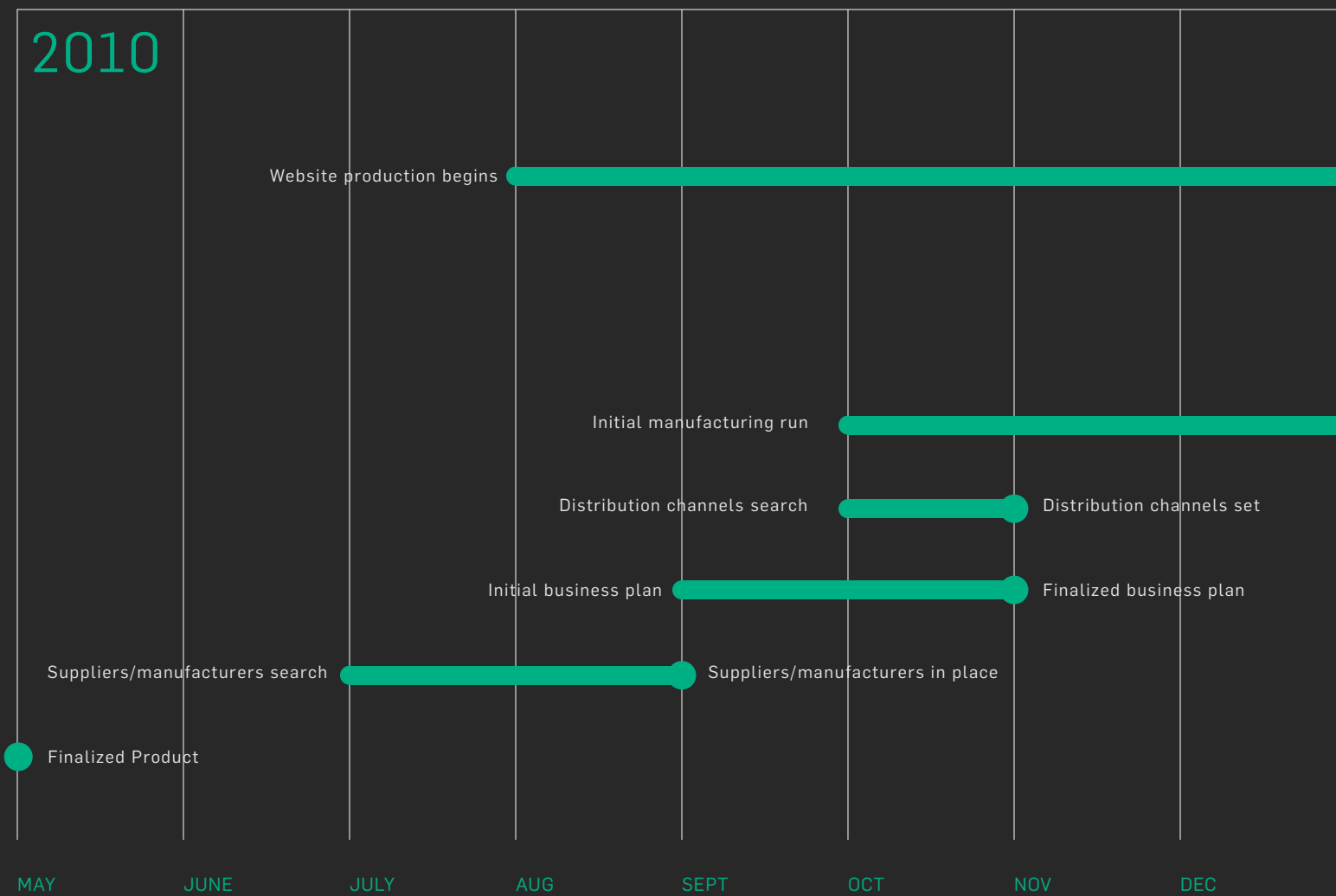
Cover



Inside



Implementation Timeline



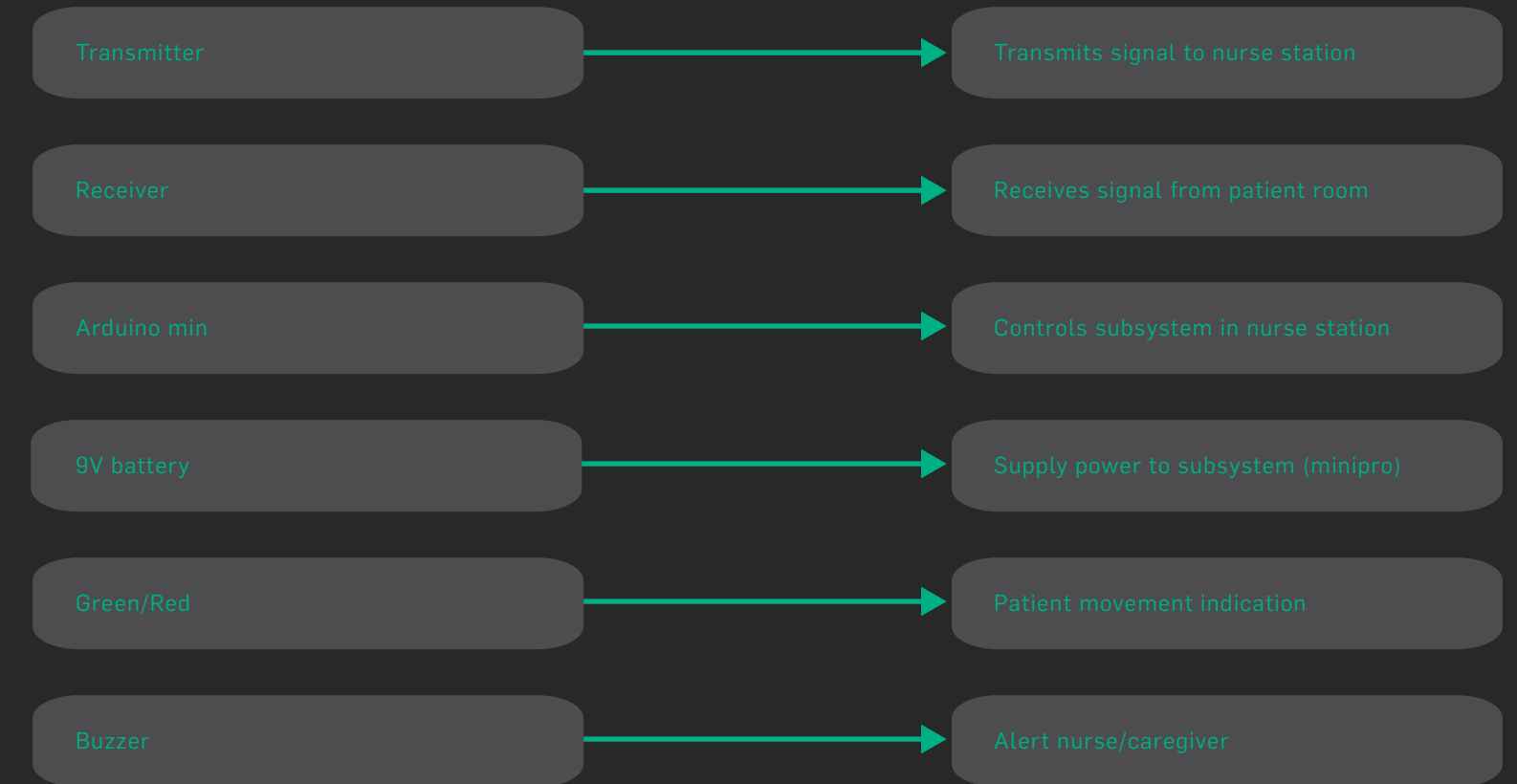
ENGINEERING

Final Product Architecture

Bill of Materials

Technical Specifications

Final product architecture



Bill of materials

Item	Description	Parts Number	Vendor	Quantity	Unit Price	Total
9V, 2.5A Wall Adapter	9V regulated, High Current at 2.5A max			1	\$9.95	\$9.95
LED - Blue	Very Bright LED - 4000mcd, 3.4v, 20mA	COM-00529	Sparkfun.com	3	\$0.95	\$2.85
Buzzer	PC Mount 12 - 2.048 kHz	COM-07950	Sparkfun.com	1	\$1.95	\$1.95
Vibration Motor	2-3.6V operation voltage	ROB-08449	Sparkfun.com	1	\$4.95	\$4.95
Arduino Main Board	ATMega 329 pre-loaded, Open source	DEV-00666	Sparkfun.com	1	\$29.95	\$29.95
Arduino Pro Mini 328	5V/16MHz, ATMega 328	DEV-09218	Sparkfun.com	1	\$18.95	\$18.95
5V Voltage Regulator	5V voltage regulator, 1.5A max	COM-00107	Sparkfun.com	1	\$1.25	\$1.25
9V Battery	9V Battery		Sparkfun.com	1	\$2.00	\$2.00
9V Snap Connector	9V Snap Connector	PRT-00091	Sparkfun.com	1	\$1.25	\$1.25
Mini Photocell - Light Sensor	1k ~10koHm, 150V, 100mW Max	SEM-09088	Sparkfun.com	1	\$1.50	\$1.50

Item	Description	Parts Number	Vendor	Quantity	Unit Price	Total
Pressure Sensor	14.5psi pressure sensor	MPX5100GP	Digikey.com	1	\$14.00	\$14.00
RF Link Transmitter	315MHz, 500ft Range, 2400 bps rate	WRL-08945	Sparkfun.com	1	\$3.95	\$3.95
RF Link Receiver	2400bps Receiver -315MHz	WRL-08948	Sparkfun.com	1	\$4.95	\$4.95
1 uF Capacitor	1uF		Radioshack	1	\$0.20	\$0.20
50 ohm 10W resistor	50 ohm 10W resistor		Radioshack	1	\$9.99	\$9.99
1000 ohm resistor	1000 ohm resistor		Radioshack	2	\$0.20	\$0.40
8000 ohm resistor	8000 ohm resistor		Radioshack	1	\$0.20	\$0.20
1.8Kohm resistor	1.8Kohm resistor		Radioshack	2	\$0.20	\$0.40
1.2Kohm resistor	1.2Kohm resistor		Radioshack	2	\$0.20	\$0.40
NPN BJT transistor	60V, 1A BJT	TIP29A-BP-ND	Digikey.com	1	\$1.00	\$1.00
					Total	\$110.09

Technical specifications

Needs - Metric Matrix

Need	Metric	Value
Detects vibration/pressure when patient steps on mat	Time to respond accordingly	Less than 1 second
Absorbs shock	Thickness of mattress	At least 3/4 inches
Is plug and play design	Time to assemble Number of tools required Number of steps	Less than 2 minutes No more than 0 No more than 7
Changes LED color for indication	Time to change	Less than 1 second
Sounds an alarm	Time to alarm	At least 2 seconds
No tripping hazard	Angle of edge	45 degree angle
Easy to clean surface	Time to clean	Maximum 5 minutes/tile
Communicates with nurse station	Time to alert nurse station	Less than 1 second
Easy to roll equipment over, Waterproof	Time to last	At least 2 years

Target Specifications

Overall dimensions (WxHxD)	Mother mat: No greater than 6' x 1' x 3' Individual tile: No greater than 3' x 1' x 3'
Weight	Mother Mat: no more than 10 lbs Individual tile: no more than 3 lbs
Assembly time	No more than 5 minutes
Transmitter/Receiver	Communicates at lease 100ft in the building
A/C adapter	Works with 100-240VAC inputs & output of 12VDC
Ambient light sensor	Is on when it's dark
Buzzer	No more than 5 seconds

BUSINESS STRATEGY

External Environment

Internal Environment

Market Opportunity Analysis

Mission Statement/Objectives

Strategies/Tactics

Financial Plan

Consumer Behavior Model

External environment

Political/Legal

Health Care is a changing industry. With a new political party in the White House and a health care reform bill in the works insurance reimbursement and payment will inevitably change. Hospitals are focusing on improving their performance scores, one way to do this is by reducing never events such as patient falls, accidental delivery of medications, and re-admittance to the hospital for the same problem. By improving their performance scores hospitals will have an easier time with reimbursement from the insurance corporations. The proposed health care reform bill will provide insurance to many more Americans. Currently 20% of Americans do not have access to health insurance, and when the new health care bill goes into effect hospitals will see an increase in patients. America is struggling with a litigious environment filled with lawsuits. This is especially true in the health care sector. New medical devices must be exceptionally safe to avoid legal issues.

Lumia will decrease the chance of a fall while walking from the bedside to the bathroom. Because it offers a cushioned lighted surface, patients risk of suffering an injury due to a fall will be decreased. This will decrease the chance of a "never event" (patient falling) for the hospital. Because hospitals are actively trying to control these risks, they are likely to appreciate the service Lumia provides. Lumia will result in fewer lawsuits and fewer patient falls.

Economic/Social/Sociocultural

Economic

The economic climate over the past few years has cooled, however, we are beginning to see a re-surge in spending, and hopefully the turnaround that will bring us back to a strong economy. With the unemployment rate close to 10% many are without employer funded health insurance and are unable to receive care for medical problems. The new health care reform bill will likely increase the amount of people covered and allow for more procedures to be performed, and medical equipment to be purchased. Because health care is a consumer driven market (consumers choose their plans by comparing coverage and cost) new products must be designed to serve the customer first. This means that health care providers and facilities will have to focus on value and service. As they learn to do more with less, innovative products will increase in demand. New products must serve the patient while remaining as cost efficient as possible.

Lumia is an economical choice for hospitals. Safety mats are readily available, therefore the materials to produce Lumia are already easy to obtain. Because Lumia reduces the risk of injury should a fall occur, hospitals will save money on procedures that would need to be performed should a fall occur. Lumia however offers a new innovative approach on the otherwise historically unchanged bedside mat. By combining the injury reducing effectiveness of the bedside mat with a guidance and alert system, Lumia adds new value as a product. Patients will appreciate the convenience and protection provided by Lumia, this may lead to word of mouth advertising and the possibility of Lumia being purchased to be used in the home.

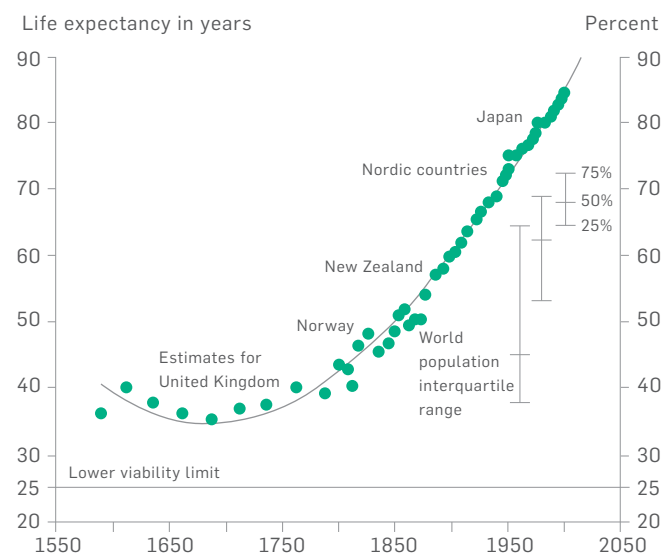
Social

There is a social stigma attached to needing assistance. Assistant devices empower individuals and allow them to do more on their own. As more patients have access to health care insurance, there will be a surge in assistant devices being sold. Also, as the Baby Boomer generation ages, there will be an increased number of patients needing assistant devices. This aging generation will require devices that make their quality of life better, without the attachment of a social stigma. Products must be designed to be attractive, easy to use, and of course, they must improve the patients lives enough to make them want to use it.

Used in the hospital setting, there is little chance of a social stigma being attached with using Lumia's guided path. Patients need to use the restroom in the night and by using Lumia their chance of falling is reduced, and the chance of injury should a fall occur is nearly eliminated. Patients have less of a chance of becoming further disabled because of Lumia. Lumia used in the home has similarly little chance of being stigmatized. The design languages chosen have a fun/protective/and futuristic feel and Lumia is aiming at not being perceived as another bulky bedside mat, but a product that improves the quality of life.

Sociocultural

Between 1960 and the year 2000 the average life expectancy increased by 7 years. 3.6 of these years were attributed to advances in health care. This was a combination of new medications, advances in surgical procedures, and new medical and assistant devices. Coupled with the digital revolution, where nearly all information is available at the click of a button, consumers demand new innovative products and procedures to both extend, as well as improve the quality of life. Consumers are also more aware of future technologies looming on the horizon, products must be designed to meet or hopefully exceed consumers expectations.



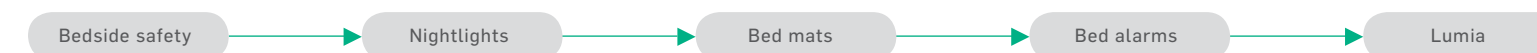
Source: Oeppen 1999

Industry/Technology/Suppliers

Industry

One of the biggest struggles within the medical assistant device industry is obtaining reimbursement from insurance companies. While medical devices are often cost-effective in the long run, the initial cost is often high. While currently physicians are the primary link between the patient and the medical devices, this may change to the insurance companies or hospital group purchasing organizations deciding what patients need for care and rehabilitation. Insurance companies will be interested in spending as little as possible, so the cheaper a medical device is, the more likely it will be used in the health care setting.

Lumia's key competitors will be suppliers of padded flooring systems. These are typically found in industrial, construction, and food service areas. While there are mats that are placed at the bedside in hospitals, these are primarily used to prevent injury should the patient fall out of the bed. Because Lumia offers a cushioned, illuminated path from the bedside to the bathroom, it would not impede on the bed mat market.



Key Competitors

Herman Miller

HAWORTH®

Hill-Rom.

HNI

LUMIA

airflex

GelPro

MEDLINE

Technology

Technology is the driving force in improving the lives of patients. Whether it be advancements in medication, new surgical procedures, or new medical devices, technology plays a role. Technology leads to a more informed patient, as information is available instantaneously in the home due to access to the internet. Because patients are informed about advancements as fast as the scientific and medical community, they demand the most up to date procedures, medications, and devices. Patients will know what to look for regarding design flaws in new medical devices, and communication over forums and blogs will quickly make these flaws apparent. Medical devices must be designed with the patients safety and comfort in mind, if not, patients will let other consumers know of the downfalls. While new technology may be expensive initially, it will lead to cost savings in the future. Because of new medical technology more patients will be able to be treated, medical problems previously untreatable will have options, and existing products and procedures are improved. New technology in padded flooring is not so much with new materials as it is with improving the injury reduction. Floor mats are being made thinner and less obtrusive, as well as being designed in innovative ways such as using silicon cells to reduce the risk of injury should a fall occur. New technology is extremely exciting. There are now flexible, flat, sheets of LED's, even new flexible lighting that can be screen printed on many types of materials. Some concerns however are the sustainability of materials used in these new technologies. Materials like PVC and vinyl and not encouraged as they are detrimental to the environment.

Lumia is using technology in new innovative ways. The use of LED's has been long established and they have become relatively inexpensive to implement into new products. Because of this there is no cost associated with developing the "glowing" capabilities found in Lumia. There is possibilities of partnership with companies making impact absorbing material. Working with these companies will decrease the need for research and development, thus saving money. Forj's design strategy with Lumia is following Herman Millers guidelines as far as material use. This includes the use of PVC and heavy metals. This has been somewhat of a challenge when designing Lumia as many lighting sources include PVC. Forj has found innovative new materials that will allow Lumia to follow Herman Millers guidelines and produce a desirable product for consumers.

Suppliers

Upstream

Herman Miller has approximately 280 suppliers upstream. These suppliers manufacture plastic, fabrics, and metal components for the furniture Herman Miller Uses. Herman Miller demands full vertical visibility from all of their manufacturers, which in many instances includes trade secrets in their manufacturing process. Suppliers must comply with Herman Millers strict policy of using environmentally friendly manufacturing processes. There have been instances where Herman Miller has switched suppliers in order to make a part more recyclable and environmentally friendly. Suppliers are generally happy to comply with Herman Millers strict design and manufacturing processes. As the pendulum swings towards consumers who are willing to pay a premium for environmentally friendly products, manufacturers will already be established as "green" and will have a place in the changing market.

- * Leed Certification
- * Natural lighting
- * Energy efficiency
- * "Reduced formaldehyde" wood board
- * Minimal Impact Design
- * Easily recyclable products

Downstream

Herman Millers suppliers downstream are retailers such as Goodman's, and Group Purchasing Organizations. Goodman's and other retail suppliers sell to the public, while GPO's work with hospitals and other large organizations. Herman Miller has well established logistics channel, and would be able to incorporate Forj's products easily.

- * Slowing economy
- * Sales promotions
- * Minimal inventory
- * Staff cutbacks

Because Herman Miller has an established logistics channel Forj's products could easily be accommodated. Herman Millers relationship with Group Purchasing Organizations would allow our products to be distributed to hospitals and other health care facilities. Their relationship with retail stores would allow our products to be distributed directly to consumers. Possible partnerships will also open new market channels. By partnering with existing customers Forj has the opportunity to distribute into previously unreachable markets.

Internal Environment

History

Herman Miller, Inc.

Founded in 1923 Herman Miller Inc is a "leading multinational manufacturer of furniture: office, residential, and institutional" (2). Herman Millers long history has built them favorable reputation. They have been featured almost yearly since 1987 in Fortune magazine's annual listing of "America's most admired corporations," as well as appearing on all editions of "The 100 Best Companies to Work for in America" (2). "Herman Miller has become recognized throughout the world as an icon of good design" (2).

Herman Miller has gained a following seen nowhere else in the office furniture market, the introduction of the Aeron Chair in 1994 is proof. Created by Don Chadwick and Bill Stumpf, the Aeron Chair revolutionized office seating with several innovative designs. A high wide back proven to take the impact of the body off of the lower spine, and a "waterfall" front edge that promotes better circulation while sitting (3). The Aeron chair boasts health benefits including, improving posture, reduces fatigue, enhanced alertness, improved morale, and improved blood circulation (3).



The Aeron Chairs success followed the boom of the dot-com era. Labeled the poster child of the dot-com era, it was said that even if you could not afford the real thing, you could buy one of the many knock offs (4). This shows the imitation that is often seen with Herman Miller products. Herman Miller takes an approach similar to that seen in Intel Corporation. Rather than waiting for the new product to be introduced and than building off of the technology, they create the new product themselves. While this leads to imitation, the constant reinventing of old designs and innovative keeps the company profitable and current.

Healthcare in the U.S. is undergoing revolutionary change—in the ways it is delivered and funded, in the comparison-shopping approach many patients are taking, and in the ways healthcare organizations are responding. Healthcare practitioners and policy makers alike understand the gravity of the changes underway; they are equally concerned about how constant, accelerating change complicates dealing with it (5).

Herman Miller realized this and has moved into the health care market. With their innovative, scalable "ER One" the event of a natural disaster or terrorist attack can be managed by any size hospital (6). Herman Millers move into the health care market has been successful. Their products can be seen everywhere from the patient rooms to administrative seating.

Forj Innovations

A transdisciplinary group of motivated, passionate individuals. With our prompt of decreasing the risk of patient falls in the hospital setting we set out to develop an innovative new product. Along the way we discovered where our groups passion stood. We all have a deep commitment to the bettering of the human experience. Whether age, disability, or otherwise, everyone is entitled to live a comfortable and productive life.

Jung-Hoon Kim - Brought up with an emphasis on the importance of a good education, Jung-Hoon came to America to study engineering. After pursuing his undergraduate degree in Washington State, Jung-Hoon moved to Arizona to pursue a PhD in Electrical Engineering. While in school he met his wife, who he is happily raising two children with. InnovationSpace has provided a challenging outlet for Jung-Hoon's creativity, and has strengthened the foundation of his education.

Arie Boyer Mittman - Brought up by two doctors, Arie always had a strong desire to decrease suffering. Working as an Emergency Medical Technician strengthened this need. At Arizona State University Arie is finishing his senior year studying Business and Biology. The integration between the two disciplines has shown to have a positive impact on the design process laid out in Arizona State Universities InnovationSpace.



Nica Scott - Industrial Design student at Arizona State University, where she has been studying product design for the past 4 years. For her senior project, she was invited into InnovationSpace, which is a trans-disciplinary program where she worked collaboratively alongside Business, Visual Communications, and Engineering students to develop a new product solution for the HealthCare Industry for sponsor Herman Miller. Prior to attending ASU, Nica's entrepreneurial spirit inspired her to launch a new medical billing company which she successfully operated for 5 years, but a strong desire to utilize her creative talents returned her to school for product design. Nica now looks forward to beginning her new career and developing products that make a meaningful difference in people's lives.

Nicholas Winter - Growing up in Michigan, Nicholas had a creative personality from birth. After first pursuing architecture at Arizona State University, he found his niche as a graphic designer. Nicholas' passion for design and helping others has built a great framework for him to succeed in ASU's InnovationSpace, as well as his future profession.

These talents brought together have been forged into Forj. Our design ideas have blended into a comprehensive style that defines us. We like the sturdy designs of the past, but are influenced by the modern age we live in. We believe that products must be optimized in their design to fit the needs of the user.

Market opportunity analysis

1. What industries might offer opportunities?

- * Hospitals
- * Nursing homes
- * In-home healthcare
- * retail stores
 - * Target, Walmart, local medical supply companies
- * Online Medical Retailers
 - * Allegro Medical, Amazon, Ebay
- * Group Purchasing Organizations

2. Potential Accounts

- * Distributed through Herman Millers established retail partners
- * Group Purchasing Organizations
- * Retail Stores

3. What do we know about each of these?

- * Economic market affecting buying decisions
- * Group Purchasing Organizations drive hospital sales
- * Buyers are looking for innovative, cost effective devices
- * Consumers demand, comfort, aesthetics, and performance

4. What else do we need to know?

- * How the changing economy will affect future sales
- * How will consumers receive our proposed devices
- * What is the growth rate for the health care sector

5. What is the potential target for each product?

Lumia has the potential to be used in every room of a hospital or nursing home. Because hospital rooms are not standardized across the board it is difficult to determine the true potential target. Lumia would be most useful in rooms where patients are able to walk on their own, but are still fall risks. Because Lumia provides a lighted cushioned walking path, it may also be applicable in pediatric rooms to substitute for a night light.

Mission statement and objectives

Lumia: Lighting the Way

1. What Business should we be in, and what is its meaning?

Forj should be in the medical device and furniture business. Forj has designed devices that assist in the healing process, re-establish patient independence, and promote comfort during a hospital visit. Lumia can be used in the room as a piece of furniture as well as a medical device. The attractive and useful design will appeal to patients, while the safety and practicality of the products will ensure the patients healing process is maintained.

2. What product/service bundles do we want to sell?

Lumia has the potential to be sold along with other Herman Miller system. Because Herman Miller already sells products that go in the patients room, it would make sense to bundle Lumia in a package for hospitals to buy. Lumia is a modular system so hospitals and other health care centers would be able to order the appropriate number of tiles they need to fit in their rooms. Lumia would be sold as a bundle because it is made up of separate tiles.

3. Who should be the primary customer?

The primary customer of Lumia would be Group Purchasing Organizations or if a hospital does not use a GPO, the product would be sold directly to the hospital. Herman Millers established connections with Group Purchasing Organizations would make the easiest transition from a designed product, to a product that is being used in the health care setting.

4. What partnerships make sense?

Partnerships with Group Purchasing Organizations makes the most sense. Because GPO's are already established providers with the hospitals, this would make getting our products into the health care market easy. Partnerships with online retailers, home health care stores, and local retailers would also be useful. This would most likely happen after the devices are already established in the hospital. Patients would recognize the usefulness of the product, and be more inclined to purchase one for their home. Most importantly will be partnerships with manufacturers of new and innovative materials. Materials such as silicon cells that are used to reduce impact, flexible lighting, and strips of LED's are already being introduced into the market. By partnering with companies producing these materials, time spent on research and development will be greatly reduced.

Strategies and tactics

Our succession plan will be created both to replace upper positions if people were to leave or die, and secondly to accelerate the transition of employees who are qualified to managerial positions. The succession plan will contain four stages.

First is identifying what roles can be filled by using the succession plan. These roles would be more middle and upper managerial positions (9). This is especially important in upper management and other high ranking positions. If a person in the organization were to pass away suddenly, a solid plan of where to pull people from is critical. The succession plan would not include jobs like sales and manufacturing, as these jobs would be easily filled by entry level workers.

The **second** level is identifying employees who fit the requirements to fill and perform highly in these roles suited for a succession plan. This will most likely come from a pool of middle management workers. In the case of the Chief Executive Officer, there would be a specific person designated to fill the position should the need occur.

The **third** level is developing talent for long term growth. These individuals picked to move up within the organization must have the skills to ensure the continued excellent performance of the company (9). By developing a clear understanding of the capabilities required to ensure this excellent performance, specific requirements can be defined and implemented easily.

The **fourth** level of the succession plan would be preparing the selected employees for advancement into each identified role. Planning is the key to a successful succession plan, and if employees are not prepared to take over responsibilities when the time occurs than there was no reason to have a succession plan in the first place.

Strengths of a strong succession plan:

- * Current employees are prepared to take on key roles
- * Talent and long-term growth are ensured
- * Overall company performance is improved
- * Improved employee retention
- * Reduces difficulty of recruiting external employees
- * Provides effective monitor and tracking of employee proficiency
- * Provides career advancement incentive for current employees

Problems created without a strong succession plan:

- * Loss of continuity
- * Potential damage to client relationships
- * Increased time spent recruiting and training replacement employees
- * Employees being unsure of their long term position in the company
- * Time lost searching for new candidates

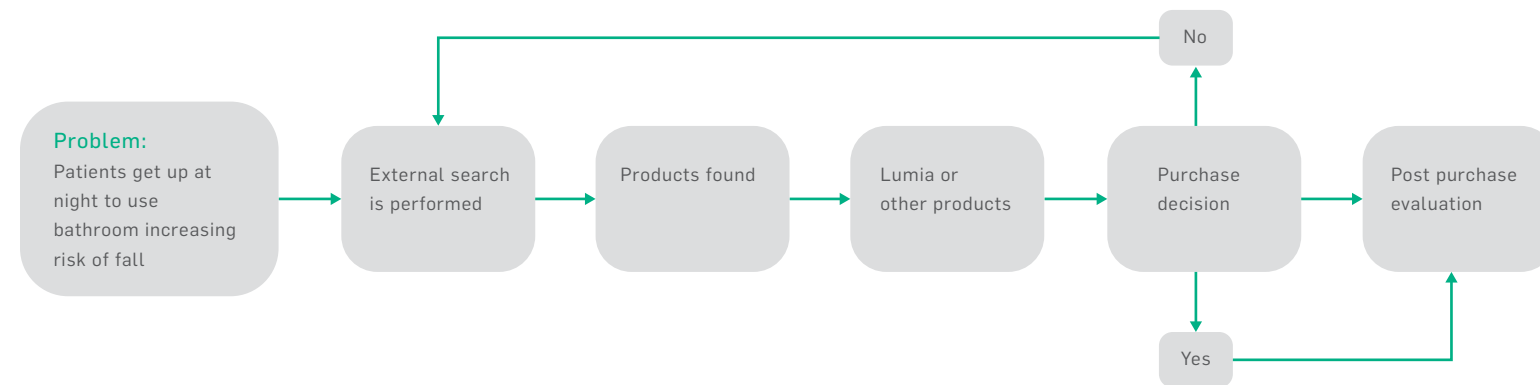
By continually revisiting and improving upon the succession plan, it will stay aligned with the goals of the company. Creating a document and then leaving it static can only result in trouble down the road. Instead, redefining the fine points of the succession plan every six months to a year will ensure that should the need arise, we will always have the employees ready and trained to move into these vital positions.

Financial Plan

Herman Miller measures their operating and financial performance using Economic Value Added. This financial measurement gauges the use of capital and generation of shareholder value. This is an opportunity and an obligation to all in the company. The training spent ensures that employees understand the process in which they can contribute to the economic and customer value.

By modeling off of Herman Miller's success, Forj hopes to operate a profitable, sustainable company. By staying small and bootstrapping we hope to keep operation costs to a minimum. Like Herman Miller, if the demand for products is not there, we will not increase labor and manufacturing activities.

Consumer Behavior Model



Income Statement

Sales Revenue

Sales	698,400	
Net Sales Revenue	698,400	

Cost of Goods Sold

Merchandise Inventory (January 2010)		
Purchases	205,200	
Transportation	10,000	215,200
Total Merchandise Available for Sale	215,200	
Cost of Goods Sold		215,200
Gross Profit on Sales		483,200

Operating Expenses

Selling Expenses		
Salaries	200,000	
Advertising	12,000	
Telephone/Internet Expenses	1,056	
Freight and Transportation Out	4,800	
Shipping Supplies and Expenses	3,000	220,856
Administrative Expenses		
Legal and Professional Expenses	50,000	
Utilities	15,500	
Insurance	15,000	
Misc. Office Supplies	1,000	81,500
Income from Operations		\$302,356

BIOMIMICRY

Functions/Application to Lumia

Functions/Application to Lumia

Product Concept

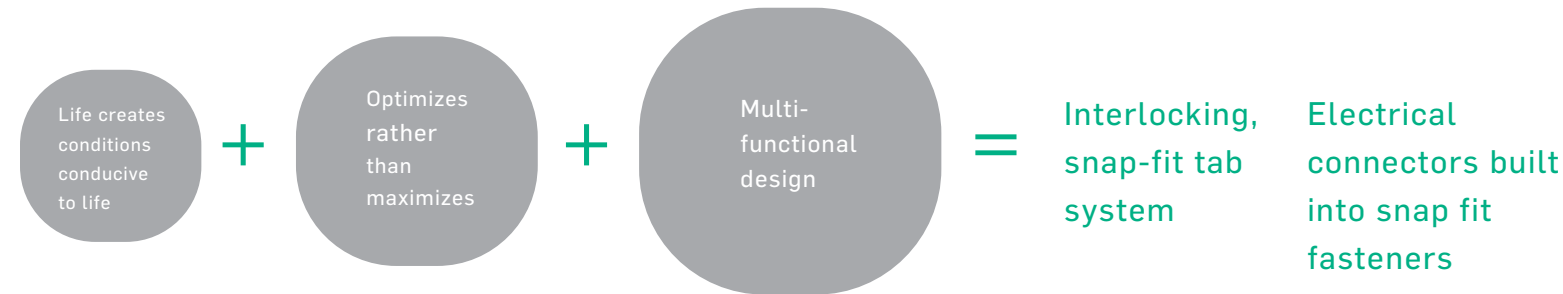
Function

Plug and Play Design

Question

How does nature make physical connections?
How does nature distribute energy?

Life's Principles Inspired Solution



Function

Low tripping hazard/Low equipment impedance

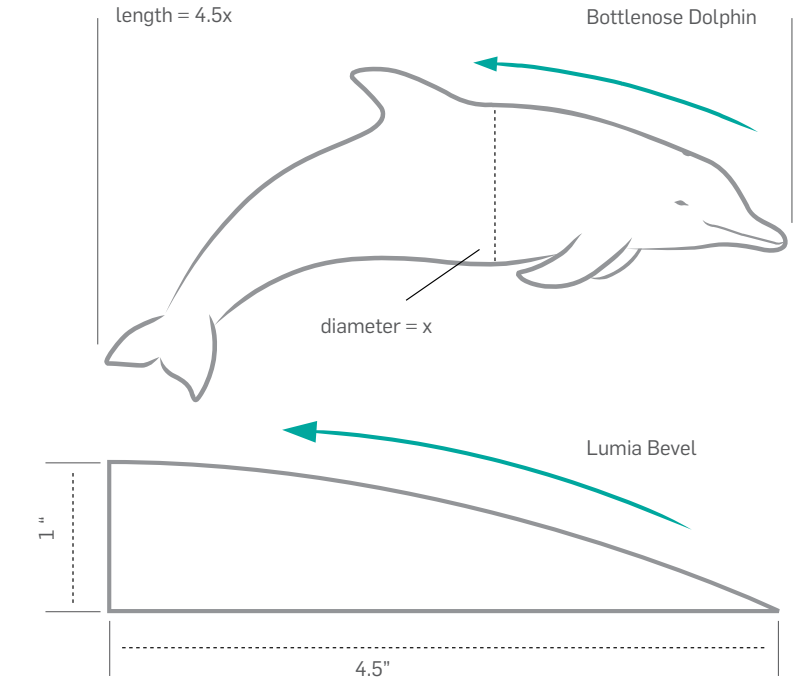
Question

How does nature NOT impede traffic/flow?

Organism Inspired Solution

Bottlenosed Dolphins

The curve of the bevels on Lumia's edges are a crucial to help prevent tripping hazards and reduce the amount of force needed to roll equipment over the tiles. The Bottlenose Dolphin served as inspiration to discover this optimal curve because of its streamlined form and low friction coefficient. Dolphins' bodies, like many other streamlined forms in nature, have a ratio of 4.5:1, or a length that is 4.5 times its diameter. For Lumia's design, tile height has been substituted for diameter.



Visual Communication Design

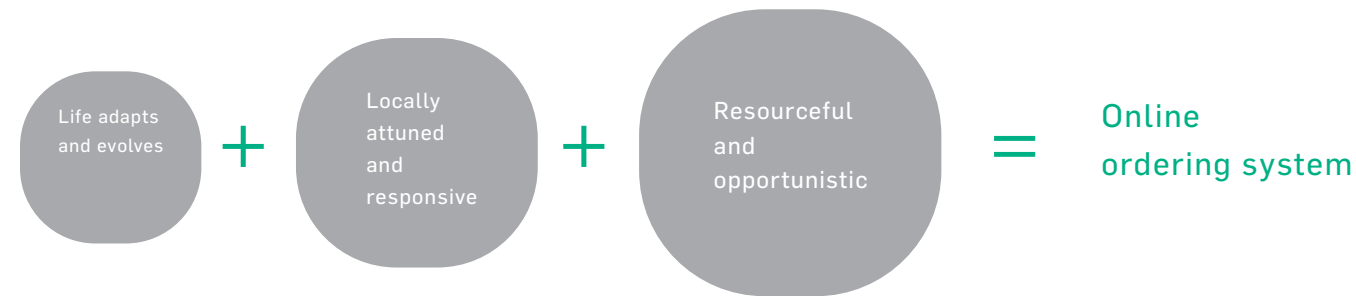
Function

Easy ordering and configuring for specific floor plans

Question

How does nature adapt to local environments?

Life's Principles Inspired Solution



When ordering Lumia, the customer begins by entering their average room dimensions. Next they will input the position of the doors, bed, and other furniture in the room. The system will automatically generate configurations for Lumia based on these variables from which the user can select. This process can be done without the need for a specialized sales team, which produces the most efficient way possible to configure Lumia to any floor plan.

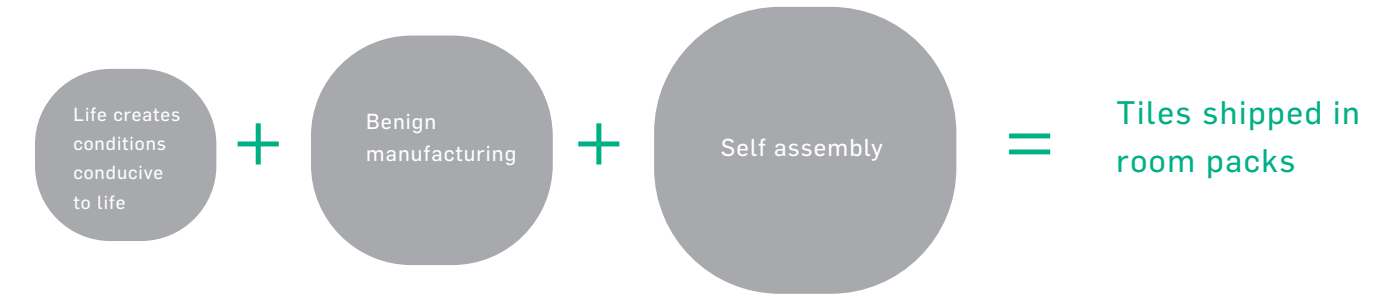
Function

Convenient installation

Question

How does nature facilitate assembly?

Life's Principles Inspired Solution



The Lumia tiles for a single room will be shipped in packs so that they are ready to be installed and do not need to be separated upon arrival. A print out of the floor plan generated from the online ordering system will be shipped with the tiles to instruct the assembler how to position the tiles. This process is benign in that it uses no tools, adhesives, or installation teams.

Business Strategy

Question

How does nature correct mistakes?

How can I make sure that good decisions are continued, and bad decisions are quickly remedied?

Solution

Natures weapon of choice is evolution. It is a hairy, scary process. There is no real thought put into the genetic mutation that drives evolution. Things happen, if they work, they will most likely happen more frequently. If they do not work, they will probably drop out of the gene pool. This can be translated into a business model. By incorporating feedback loops, we will be sure that the good decisions continue, and any bad decisions will quickly be realized and dropped.

Natural selection relies on fitness. An organism is considered fit as long as it passes its genes on to the next generation. An organism that does not live long enough to reproduce is not fit. These traits that allowed the parent organism to survive to a reproductive age will be passed along while the genes that did not fare well will be eliminated.

This applies to Forj in the following ways. Investments will be carefully monitored to ensure that profitable decisions are continued, and non-profitable ventures are discontinued. This is similar to diversifying an investment portfolio. By balancing risky investments, with low risk investments, the total risk will be minimized. The thought is that while some risky investments will prove profitable, there will also be those that lose money. By diversifying risky and solid investments, Forj will remain profitable.

Like natural selection, these choices will rely on fitness. An investment that was returning would be considered more fit than an investment losing money. This would likely be the model we would use to measure fitness, monetary return. By measuring the return on investment and eliminating the weaker investments our company will evolve and to continue to grow more profitable

This applies to biomimicry in the following ways. Like evolution, our business model will include natural selection. These feedback loops provide the information as to what is and what is not working. Like in nature, traits (or investments) that prove more advantageous than others will be passed on to the next generation (or continued being invested in), and those that do not work as well will be bred out (or discontinued investment)

Question

How does nature add function to preexisting designs?

How can I integrate the product ordering system with existing functions within the marketing/branding material?

Solution

Nature optimizes rather than maximizes and incorporates multi-functional design. Instead of having a separate page for laying out Lumia tiles in the hospital room simulation, and a separate page to order the appropriate number and style of tiles, combine the two. As the user lays out the configuration needed for their particular hospital or care facility the website will be tracking the layout and filling out an order form. When they have gotten to a layout that they are satisfied with, they will simply need to press the order now button and all of the specifications for their order will be automatically compiled.

This optimization can be seen often in nature. The Australian Christmas Tree claims water from surrounding plants by infiltrating their root system and re-routing the water to the Christmas Tree. While the ordering system will not be stealing information from the layout and configuration page, it is still optimization. By scraping the data and automatically placing it in an order form there is no need for the user to complete this extra step. This saves the user time, and hopefully will make the ordering process more streamlined and enjoyable.

Another example would be the evolution of feathers as display/predator evasion to flight. Dinosaurs developed feathers but they were not situated to allow for flight. They were thought to be used to show threat displays or to attract a mate. Also, similarly to lizards, the feathers would come off if bitten allowing the dinosaur to escape and re-grow the feathers later. Feathers for flight were believe to be developed as feathered organisms aided themselves while running uphill by flapping their wings to reduce their weight. Like the feathers, Lumia's ordering system will use multi-functional use out of the layout program.

By implementing a smart ordering system Forj will optimize our web page. The integration between design and the ordering process will be seamless, and this will provide a benefit to the user. It will also benefit Forj as there will be a much smaller risk of fulfilling an order incorrectly.