

Yes, it's already that transitional time when our current year ends and another begins, and today and tomorrow are quickly changing hands. Rather than look back at significant trends of the past 366 days (2012 was a leap year, remember?), we asked a wide variety of technologists, designers, and strategists across frog's studios around the world to take a look to the future. The near future, that is. "Near" in that 2013 is not only upon us, but also "near" in that these technologies are highly feasible, commercially viable, and are bubbling up to the surface of the global zeitgeist. We believe you'll be hearing a lot more about these trends within the next 12 months, and possibly be experiencing them in some form, too.

Here's our second annual list of Tech Trend predictions for the coming year. There are 20 individual forecasts and, new for 2013, we've also related each prediction to larger waves in business, culture, and innovation.

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Rip, mix, burn gets physical

comes of age KALLE BUSCHMANN

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HUMAN-COMPUTER INTERACTION **GETS MORE** HUMANISTIC

MARK ROLSTON CHIEF CREATIVE OFFICER, AUSTIN

In 2013 we will come to the conclusion that the technology industry is overdue to create the next model for human-computer interaction. The old PC model has peaked. The world yawns at the introduction of yet another iPad, Android handset, Windows release, or super-thin laptop. Slimmer, smaller, faster doesn't solve our most urgent problems. We need to take the computers out of computing and more humanistically integrate them into everyday life.

THE DAWN **OF ROBOTIC** HANDICRAFT (AND THE ARTISANAL HANDSET) ARRIVES

JONAS DAMON CREATIVE DIRECTOR, NEW YORK

As smart phones continue to become the connective tissue of our everyday lives, their build quality will finally begin to reflect this significant role. Smart phones are the conduit to the musical scores of our lives; the vessel of friends', family's, and strangers every moment caught in pixels; and the bearer of written words to just about everyone we know (and don't know). They are the holders of every significant artifact that identifies us as one out of seven billion other humans. But until now, these devices have been largely made of plastic parts cheaply molded, painted, and snapped together

Thanks to advancing manufacturing innovations and investments, we will see an unprecedented boost in handset build quality. Smart phones will approach and surpass the fine craft and quality traditionally reserved for Swiss watches and heirloom jewelry. Original Device Manufacturers' (ODM, such as Foxconn) investments in robotic assembly lines are enabling handset housings to be carved out of single blocks of material: the HTC One and the Nokia Lumia series have pioneered unibody enclosures, setting the table stakes. Like watch cases, unibody construction leads to thinner, stronger and stiffer devices. Robots will enable components to fit together so closely, every component in a pair will look and feel custom made for its partner. The iPhone 5's inlaid glass and ceramic panels are the first out of this gate. Glass-forming technology will allow handset screens to be less a cut-out shard than a finely ground lens. The Nokia Lumia 920, with its rolled screen edges, will be the first of many artisanal handsets bearing this detail, and others.

WE LOSE **CONTROL OF OUR CARS**

KATIE DILL CREATIVE DIRECTOR, SAN FRANCISCO

Our cars are becoming ever more automated. They are parallel parking themselves, monitoring our speed while in cruise control, and now they're even helping us steer. With cameras, sensors and robust computer intelligence, the car is getting smarter and more self-sufficient.

Americans have long looked at the road and the ability to drive as a sign of freedom and control. Yet in the U.S., fewer twenty- and thirtyyear-olds are getting their driver's licenses than in previous years. This is a trend seen across wealthy nations with high Internet usage. Could our Internet connection be our new driver's license—the conduit to connect, explore, and socialize? Perhaps the car isn't what it once was; now it is merely a way from point A to point B, not a symbol of freedom that a smart phone is. Marry this new reality with safety and energy concerns, and automated vehicles get more attractive.

Google's Sergey Brin claims that in 2017, "Google's self-driving cars will be available for everyone." This may seem bold, but it's not science fiction either. According to a survey from J.D. Power and Associates of 17,400 vehicle owners, more than a third (37 percent) of all respondents said they would be interested in purchasing a fully autonomous car (if price wasn't a factor).

Meanwhile, many car companies are getting into the automated vehicle race (including BMW, GM, Volvo, Volkswagen, Mercedes-Benz, Cadillac), and as infrastructure increases to support them, the trend is likely to accelerate.

VIRTUAL MANUFACTUR-**ING STARTS SMALL**

PATRICK KALAHER ASSISTANT VICE PRESIDEN STRATEGY, BOSTON

While 3D modeling and 3D printing have been with us for a while now, this year we'll see the rise of virtual manufacturing. Services like Shapeways, Ponoko, Sculpteo and i.materialise, which operate as shared factories for hire, will become a common back end for small-scale (10-1,000) unit manufacturing. Think of this as analogous to the hosting of virtual servers in a distributed data center, except in this case, the virtual servers are CNC (Computer Numerically Controlled) manufacturing equipment and the distributed data centers are virtual factories, spread around the world. Amateur as well as professional designers and makers will essentially be able to print objects to specification any time, without having to buy printers and factory space.

OUR RELATION-SHIPS WITH OUR SMART PHONES



MATTEO PENZO TECHNOLOGY DIRECTOR, MILAN

In 2013, the combination of 20-nanometer processors (ARM, Intel, and Apple are planning launches for Q2/Q3) and 4G Networks becoming available in most countries will alter how we use our smart phones.

Higher computational power, reduced energy consumption, and faster data communication in our hands will accelerate the development of biometric applications, such as the authentication of the eye or fingerprints through a hand-held device's camera. This will play a big role in sensitive applications such as mobile banking or payments. Pairing biometric authentication with voice-based logins will start becoming the norm, granting us faster and more secure access to information. As a result, private databases storing bio-information will arise, fueling start-up and funding action in this area.

We can look forward to a time when the authentication layer won't be based on our human memory anymore. In 2013, we'll move closer to a time when we won't be forced to rely on easily forgettable (and not very secure) passwords because each of us, with our biological individuality, will become our own password.

AUTOMATED INTELLI-GENCE AIDS OUR DIGITAL DOPPEL-GÄNGERS

ROBERT TUTTLE

EXECUTIVE TECHNOLOGY DIRECTOR. AUSTIN

Monitoring and responding to the ever-increasing volume and complexity of the various feeds, threads, walls, streams, notifications, updates, and requests that permeate our digital lives has long become a full-time job. Current personal, professional, and commercial social networking services offer relatively crude aggregation and classification interaction models for managing and directing our online personas. In 2013, we'll be able to find more qualified hired help.

Emerging tools and services will help translate our needs and desires into cloud-based automation. They will proactively work on our behalf, guided by our permission and divining our intent. Existing services such as Google's Prediction API (developers.google.com/prediction), which offers pattern-matching and trainable machine learning capabilities to developers, and IFTTT (ifttt.com/wtf), which offers intuitive, user-friendly, and cloud-based rules engine expressed in simple "if this, then that" terms, are representative of the trend towards empowering more automated, if not quite yet artificial, intelligence for our digital alter-egos.

RIP, MIX, **BURN GETS** PHYSICAL

ANNIE HSU SENIOR STRATEGIST, SAN FRANCISCO

The notion of taking existing content, remixing it, and giving it new life in an instant is one that's lived primarily in the digital world thus far, due to the relatively low cost and nearly instantaneous access to content and workable assets.

The notion of remixing is on the cusp of entering the realm of physical objects. One key driver is the precipitous decline in prices of 3D printers. Six years ago, the cheapest machine was \$30,000, and today you can find one for \$550. A second driver is consumers' ever-increasing expectations of fast shipping, as currently delivered by Amazon Prime and eBay, priming us for the next generation of instant gratification.

The killer app is going to put the power of ultimate customization in consumers' hands in 2013, unleashing the new standard for creativity plus utility.

INTERACTION **CHOREOGRA-PHY GOES SHOPPING**

JARED FICKLIN FROG FELLOW, AUSTIN

Gesture will quickly become the new technology driving shopping experiences at the mall. The proliferation of high-dollar marketing experiences will quickly yield to many more gesture-based, brochureware kiosks-where the person-as-controller will find life beyond living room dancing games

USSD IS THE FUTURE **OF FINANCIAL** INCLUSION

RAVI CHHATPAR EXECUTIVE STRATEGY DIRECTOR, JOHANNESBURG

Although the promise of low-cost smart phones has the potential to fundamentally revolutionize emerging markets, the quotidian reality for many people in Africa, India, China, Southeast Asia, and South America is the simple and functional feature phone.

For most consumers in these markets. the sophistication of mobile interaction is defined by the familiarity with which cumbersome Unstructured Supplementary Service Data, or USSD, codes (keypad commands, e.g. *141*12-digit-number#dial) are used for any service outside of voice and SMS (e.g., adding airtime). For mobile innovators, this is arguably the lowest of the lowest common denominators in technology, but it in fact is the most compelling

Financial institutions are realizing that attempting to replicate a service borne out of unique and aged local conditions is a losing proposition. For several years, Kenya's M-Pesa has been touted as the seminal example of emerging-market innovation, but the reality is that it was a brilliant example of being at the right place at the right time, at that perfect intersection of hyper-connectivity (mobile) and non-connectivity (infrastructure) in a country that needed a remittance solution more than anything. It does not neatly translate into other scenarios; it is not a one-size-fits-all solution, and neither should it be. Since M-Pesa's debut, entrepreneurs and institutions have tried to replicate M-Pesa in many countries over the years and have consistently failed. Real financial services disruption that acknowledges the role of the informal sector, the importance of community, the need for alternative assessments of risk, and the blending of traditional financial product categories is what will define truly meaningful innovation. And all of these will still be delivered through that most simple, basest, crudest of mobile technologies-USSD. In 2013, an aspiring innovator will define success with this approach.

WE EMBRACE **A NEW TYPE OF PATINA**

PAUL PUGH

VICE PRESIDENT OF CREATIVE, SOFTWARE INNOVATION, AUSTIN

A key aspect missing from the mobile experience today is the concept of patina, or the wearing that comes with regular use. In the physical world this might be the dog-eared pages of a favorite book or the small scratch on an LP that occurred at a rocking party. This slight degradation in quality is actually part of the story and part of our culture. The miniaturized and regenerated versions of our legacy are more often sanitized pointers. The next advance in mobile comes not from further miniaturization of our lives into a smaller package, but rather the unpacking of those experiences into the environments around us. Mobile becomes a halo that surrounds us and travels with us wherever we go.

Devices on our bodies will multiply. Sensors, cameras, input methods, and displays will work their way into our clothing. They'll listen for commands and whisper in our ears Our environment will respond to us in new and interesting ways. The proliferation of large displays and projection technologies will relegate the small display on our phone to private or a constrained set of tasks. A new layered interaction model of touch, voice, and gesture will emerge as important as consumption: the continuous exchange of what we are doing, where we are, and who we are with. This will again work into the collective memory, attaching to our legacy-bringing in a new type of patina effect. It won't be the same as physical degradation, yet will offer fresh stimuli that allow for more meaningful navigation and recall.

WE REACH THE TABLET TIPPING POINT

MARIO VAN DER MEULEN CREATIVE DIRECTOR, SHANGHAI

Crystal-balling next year's trends is never far off from what we see now, but nothing sonalized guidance, individual health data that happens overnight. One solution that could is collected will increasingly be used to provide make its long promised impact in 2013: the more proactive care at the population level. dropping price point of tablets. This will start Yes, many connected care solutions that collect to bring a shift from tablets being miniindividual data exist today, from Patients Like computers to their role as the widespread Me, a data-centric social networking site; Cure replacement of printed media, from payment Together, a health-tracking site; and Asthmapo lis, a system that allows patients to connect to a receipts to newspapers to textbooks. Lower prices will prompt people to buy numerous mobile app via a sensor-enabled inhaler. In 2013, tablets, each optimized for different purposes expect more services such as these to emerge Lower prices will also make tablets a gameand grow. They synthesize information to make changing device in emerging economies in it more relevant to providers and patients alike, Africa, South America, and Asia, and will and therefore actionable; then these services bring new challenges to the interaction broadcast their analyses to improve the quality model worldwide of life for not just one, but for all.

There has been a documented reduction in the media industry's paper usage because of the adoption of tablets. These devices also use less energy compared to PCs, and could work well with renewable solutions, such as the solar energy grid. These factors, combined with less of a reliance on a physical transportation and distribution model, where combustion engines still rule, will also help push forward tablets as the timely, earth-friendly, and cost-saving alternative to paper

FACES BECOME **INTERFACES**

JAN CHIPCHASE EXECUTIVE CREATIVE DIRECTOR OF GLOBAL INSIGHTS, SAN FRANCISCO

Starting in 2012, the cues to signal recognition (and the social literacy around those cues) are set to change. Currently, personalized greetings are commodifized: restaurant workers ask your name and then shout it when your order is ready: we receive customized spam messages and automated birthday wishes. Increasingly, this trend toward the value of commoditized recognition will be supplemented by the use of facial recognition software

Ubiquitous cameras in retail displays, in hotels, in the palms of our hands via our smart phones, point toward our faces. Soon, algorithms will match them with photos, and then connect us with related personal and professional information on us available online. In 2013, as faces increasingly become interfaces, we will begin dealing with new questions around the loss of physical anonymity. And some

professions-researchers, undercover cops, spies, journalists-whose livelihoods depends on not being recognizable, are in for a bumpy ride. While such careers will be destroyed by real-time recognition, others will be enabled, as there will be new legions of people that will

SENSORS. SOCIAL **NETWORKS CHANGE** HEALTH **BEHAVIOR**— **ON A LARGE SCALE**

MONTANA CHERNEY ASSOCIATE CREATIVE DIRECTOR, SAN FRANCISCO

Why just prompt behavior change on an individual level, when we can do so much more? Behavior evolution—or behavior change at scale and over time—is the new frontier. Ubiquitous connectivity, real-time remote monitoring, and social networking are three of the most prevalent factors revolutionizing health care. We'll see more and more people connect to devices, share their data, and reach out to others. Doing so will allow them to enhance their care experiences by relating with others with similar symptoms. receiving social support for achieving goals, and "crowdsourcing" treatments and cures.

In addition to patients receiving more per-

become the true "faces" of brands

brain" tech fields, from healthcare equipment to enterprise software, will be wise to experiment with crossing over into right-brain territory. Doing so could enhance their methods of finding fresh ideas and then, more important, adding emotional appeal and details to potential products. In this way, consulting with artists could compliment design beautifully: imagine a world

> also more poetic and resonant, objects and experiences THE **EXPERIENCE ECONOMY COMES OF AGE**

KALLE BUSCHMANN

SENIOR INTERACTION DESIGNER, MUNICH

thinking. And arts education does have its

Airbnb, founded by two RISD graduates.

with not only more usable and relevant, but

proof of success in the \$1 billion valuation of

Companies focused on traditionally "left-

For a long time Apple has been the poster child for the product and business development of experience-driven technology-and its success. But in the last two to three years we have seen new players, such as Square and Dropbox, enter the market. As a result, established companies are being pressed to change their game. Specifically, the big ecosystem players: Google with Android, Microsoft with Windows 8 and Surface, and Amazon with the Kindle, have done their homework, redesigned their websites, applications, operating systems, services, and added self-developed hardware They all have one common goal, no matter how different their businesses: to optimize and differentiate the customer experience. In 2012 many of these efforts saw the light of day, but it will be in 2013 that the recent developments will reach their climax as customers start to respond to the new product landscape.

One thing that these product ecosystems have in common is that they don't focus on the technology as a key differentiator anymore. Customer experience has become the only source of long-term competitive advantages, and today the main barrier to great experiences isn't the tech. It's business cases, company cultures, and the capabilities to deliver and orchestrate the intended experience through all touchpoints over time. Likely there will be more Chief Experience Officers named in 2013. Such CXOs do exist: McCann-Erickson, the ad agency, appointed one in late 2012-with a graduate degree in interaction design.

THE **ART OF INNOVATION GETS EVEN MORE** ARTFUL

REENA JANA EXECUTIVE EDITOR, NEW YORK

In 2013, we'll see more of the world's engineers, scientists, and business people look to art-yes to sculpture, architecture, fiction, film-for creative inspiration

Of course, there's been a long history of well-rounded innovation dating back decades (IBM hiring sculptor Isamu Noguchi and designers Charles and Ray Eames in the 1950s) and centuries (the Italian Renaissance). More recently, a few wide-ranging examples of a growing trend include the New York Times' hiring of an artist-in-residence to experiment with compelling data visualization as a competitive advantage; Intel naming musician will.i.am as director of creative innovation, to share his deep awareness of popular culture; and robotics start-up Willow Garage collaborating with a Pixar animator to develop more attractive machines.

Academically, Rhode Island School of Design President John Maeda—himself a media artist-has spoken before Congress on the importance of adding arts education to science, math, and engineering curricula in the United States to promote inventive

MICRO-NETWORKS RISE

DAVID SHERWIN

PRINCIPAL DESIGNER, SAN FRANCISCO

Micro-networks are intimate communication networks that people form around subjects of interest to them, whether as simple as their love of chocolate or as complicated as a shared passion for creating change in a loca community. Most of these micro-networks are private, and rarely visible to the designer or trend-spotter

These micro-networks have been fostered in local communities via face-toface conversation or via email and phone. but just-in-time communication tools have allowed the content of these conversations to persist—and store what people are sharing over time. They encourage connection with people that had previously not been able to ioin those conversations

Social platforms such as Quora and Facebook have exploited the budding micronetwork trend, allowing knowledge to surface from these communities. Platforms such as Neighborland, frog's Collective Action Toolkit, and Change.org allow micro-networks to gain momentum and grow around desired political and community change

Identifying micro-networks and ethically researching how people participate in them will be an important part of how we design ar product or service that's meant to collect and share knowledge in 2013. By combining ethnography with an awareness of what people are doing through their micro-networks, we can gain visibility into trends that are happen ing, but aren't always in public view. It can also point us to new and growing private communities that help illuminate for us emerging shifts in customer behavior

DATA **ECOLOGY BECOMES MORE DIVERSE**

SCOTT NAZARIAN CREATIVE DIRECTOR, SEATTLE

Data is becoming a critical material in the sustainable success of cities. The flow of information, if analyzed wisely, will help the strongest cities of the future survive natural disasters and population spikes, among other challenges

Data production and consumption continues at an inexorable pace, creating ever more symbiotic feedback loops across both data types and physical experience. There is not just one stream of "data" waiting to be sifted through, across cities, nations and the globe-although in many ways we tend to speak of data currently as one enormous, abstract entity

One example of a coming interweaving of various data flows and physicality is the UID project now in motion throughout India which seeks to provide biometric identification for Indian citizens. This initiative, in the world's second most populous nation, will likely introduce unprecedented (biometricto-digital) data-scale thresholds in the very near future. This new scale promises to trigger emergent experience and interaction needs. The accretion of "new data" (persona contextual) will begin to intersect over time with "big data" (archival) structures, yieldin unprecedented "tertiary data"—it begs us to wonder, what will we do with this informa tion? What are the business implications? The civic ones? Will we create new types of urban experiences that reflect our analyses of data foremost, versus our creative or philosophical visions?

An incredibly diverse data ecology will set the stage in 2013 for the next generation of municipal and private sector innovations.

SMART PHONE ACCESSO-**RIES BECOME** SMARTER

TIMOTHY MOREY

ASSISTANT VICE PRESIDENT, STRATEGY, SAN FRANCISCO

I recently interviewed a doctor who had used AliveCor's iPhone ECG on a flight to diagnose a fellow traveler with a heart attack. The device is an iPhone cover with sensors, and the doctor's diagnosis led to an emergency landing to get the passenger to hospital. (Yes, he lived.) The iPhone ECG is a dramatic example of a plethora of devices I expect to see come to market through 2013smart accessories for smart phones. Smart phones have always had a thriving accessory market, from covers to keyboards, but smart accessories are more than just accessories with sensors. They herald the establishment of smart phones as the primary computing and connectivity hub linking people to the network. Beyond 2013, our phones will be the center of a sensor network around our bodies, offices, homes, and cars, and eventually the very cities and spaces we live in. But in 2013, we will take the first step in this journey with smart accessories.

APPS BECOME **INVISIBLE**

THOMAS SUTTON EXECUTIVE CREATIVE DIRECTOR, MILAN

Some recent popular visions of the future focus on making every available surface into a computing interface, and every moment or action of the day into a computing interaction But pundits who prescribe such visions also ignore what's really happening. Computers are dissolving in three directions-into the cloud, into the environment, and into our bodiesbut as they do so they are reducing or losing altogether what we would traditionally call an "interface." Metaphorically, if a laptop browser is a window on the web, a smart phone application is a keyhole, then the next generation of smart devices, applications, and services will be pin-pricks

Services like the Nest learning thermostat and Siri show some early indications of what this can mean. Sound, voice, body sensors, location, and movement can be used as explicit or implicit input/output mechanisms. Vast amounts of cloud-based computing power can resolve ambiguous instructions, understanc behavioral patterns over time, and reduce "answers" to their simplest and most digest ible form: a couple of words (Siri) or a single numerical value (Nest). Our hands, eyes, and minds are free to engage with the real world and real people around us.

In 2013 I expect to see an increasing num ber of services that follow this paradigm while exploiting today's mobile phones. I call these "invisible apps," because they shun flashy infographics and rich GUIs in favor of minimal timely, personal, and humanized content. They represent first steps towards a future of technologically supported simplicity.

WE FACE MORE TECH DISRUPTION— **BY NATURE**

MICHAEL MCDANIEL PRINCIPAL DESIGNER. AUSTIN

In 2013, I believe Mother Nature will be a major disruptor and will have profound, far-reaching impacts on technology in general. Hurricane Sandy impacted the densely populated North eastern United States with a painful punch in late 2012, but with a few months of recovery, in 2013 we will start harvesting ideas that promise to help people and communities become more resilient when facing such a large-scale tragedy, when lives, homes, and livelihoods were deeply affected—or even destroyed.

The reaction to the widespread and sustained loss of power in the New York City area after Sandy will start spurring tech innovation in energy and storage. I think that the next titan of industry, along the lines of Gates or Rockefeller, will be the person who invents better power storage, not a new form of power generation. Better power storage not only keeps things humming when all else fails, but allows all sorts of things to become practical, from electric cars to green energy sources such as solar and wind. Hurricane Sandy pain fully illustrated how fragile a centralized power grid is. Hopefully, one positive aftereffect of the storm's impact will be the emergence of new forms of power storage to rival the energy density found in a single tank of gasoline.

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