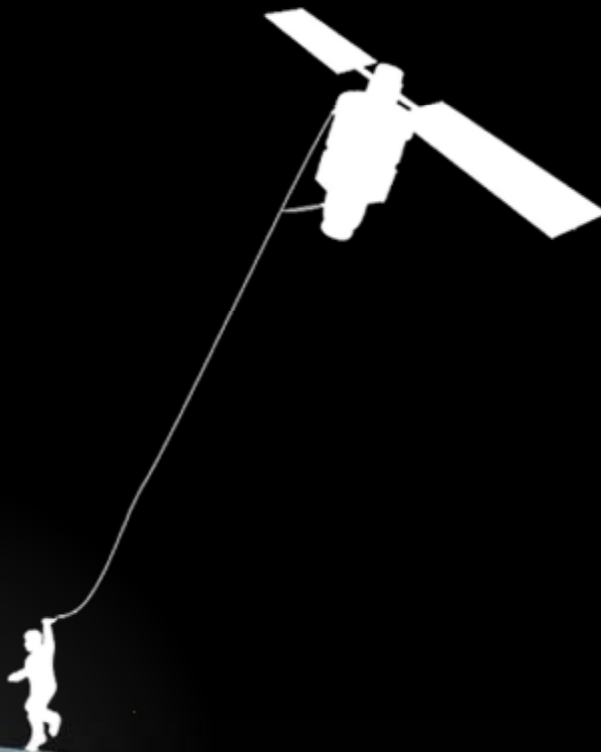




# participatory exploration

the role of the user contribution system



a presentation by **nicholas skytland**  
given at the 2009 NASA Project Management Challenge  
available for download at <http://www.slideshare.net/skytland>

what is “**work**” ?





what is a “**worker**” ?

what is the “**office**” ?





what is a “**contribution**” ?

what is “**innovation**” ?





the world and workforce are becoming increasingly **connected** and **networked**

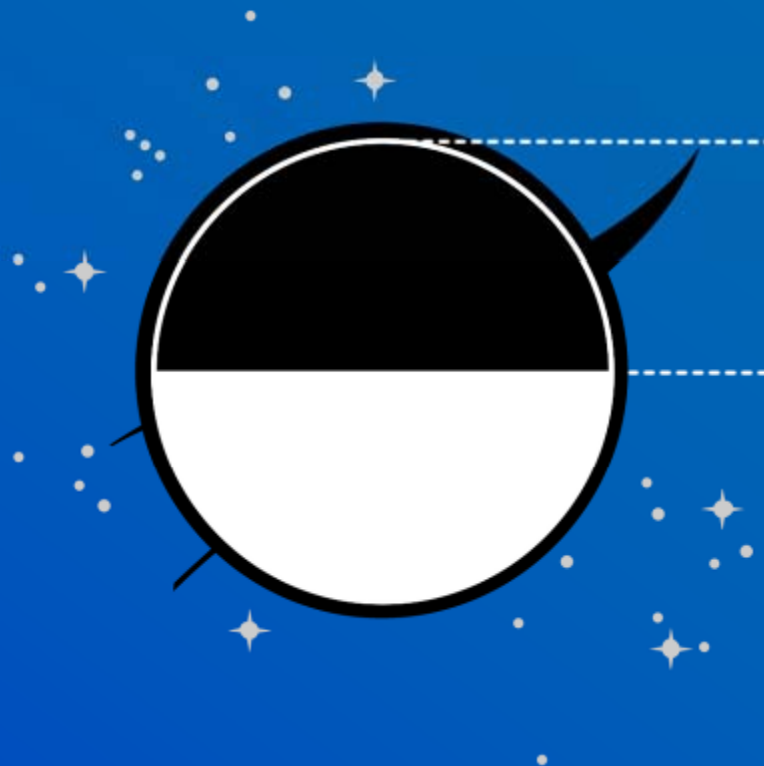




the global economy is increasingly  
dependent on **people** and their  
**knowledge, skills, energy, and expertise**



driven by the development of new  
**disruptive technologies** and **platforms**



lets explore how **NASA** can apply

the global shift in **demographics**

the popularity of **collaborative technology**,  
and desire for **participation**,

to the future of space exploration

**I** the evolution of work

**II** the engagement gap

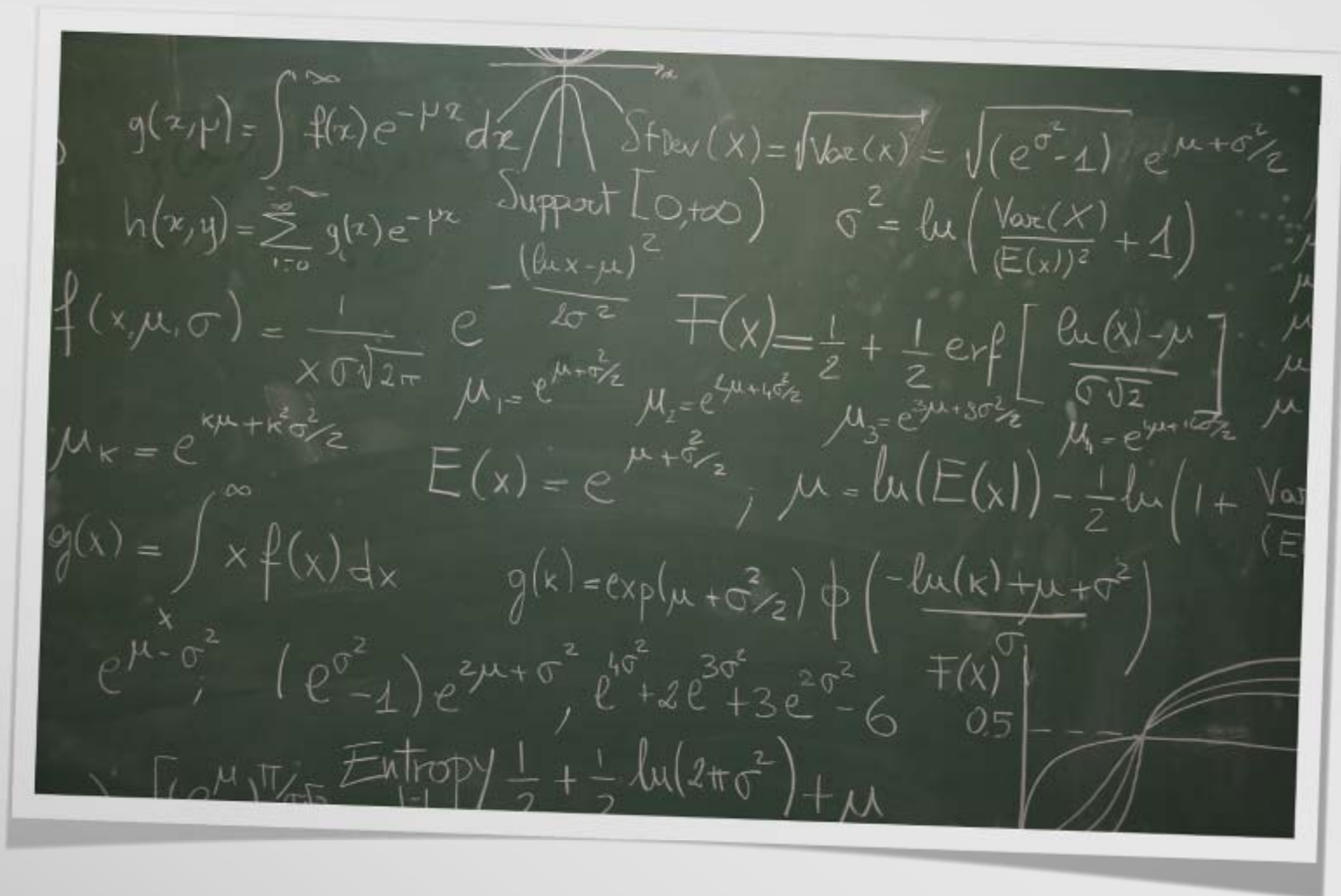
**III** user contribution systems

**IV** a case study

**I the evolution of work**



the industrial age revolutionized work by replacing **muscle** with **machines**



work was defined in reductionist terms as the **application of energy to matter** to transform it



the **worker** was reinvented





everyone could **contribute**



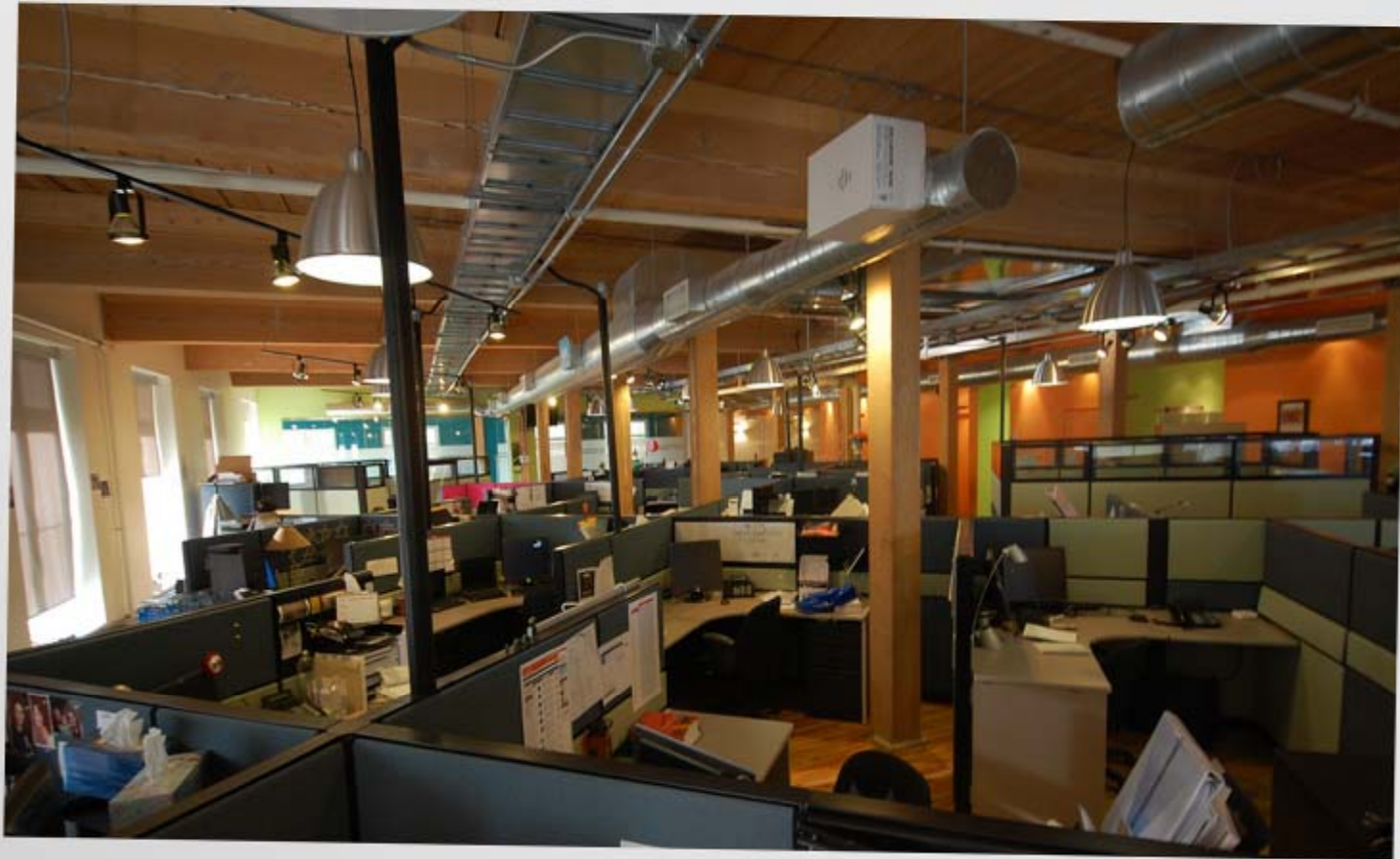
work was **mechanized**



the concentration of labour into factories  
brought about the rise of large towns



industrialization laid the foundation for  
the modern world



it has shaped everything from  
**where we work...**



to when we work...



to **how we work**

**“work”** is changing  
(again)





we are moving from  
the **machine age** to the **information age**

<b>Structure</b>	Hierarchical	→	Networked
<b>Scope</b>	Internal/closed	→	External/open
<b>Resource Focus</b>	Capital	→	Human, information
<b>State</b>	Static, stable	→	Dynamic, changing
<b>Personnel/focus</b>	Managers	→	Professionals
<b>Key drivers</b>	Reward and punishment	→	Commitment
<b>Direction</b>	Management commands	→	Self-management
<b>Basis of action</b>	Control	→	Empowerment to act
<b>Individual motivation</b>	Satisfy superiors	→	Achieve team goals
<b>Learning</b>	Specific skills	→	Broader competencies
<b>Basis for compensation</b>	Position in hierarchy	→	Accomplishment, competence level
<b>Relationships</b>	Competitive (my turf)	→	Cooperative (our challenge)
<b>Employee attitude</b>	Detachment (it's a job)	→	Identification (it's my company)
<b>Dominant requirements</b>	Sound Management	→	Leadership

the implications are profound

“Work has become more cognitively complete, more team-based and collaborative, more dependent on social skills, more time pressured, more reliant on technological competence, more mobile, and less dependent on geography”

Wikinomics by Don Tapscott and Anthony Williams





work is increasingly the  
**application of knowledge**  
and **manipulation of information**



people are more than ever a source of critical  
**skill** and **knowledge** as well as sustainable  
**competitive advantage**



“Previous technological-driven revolutions, like the electrification of industry, took the better part of a century to unfold. Today the escalating scope and scale of the resources applied to innovation means that **change will unfold more quickly.**”

Wikinomics by Don Tapscott and Anthony Williams



the **worker** is being re-invented



**when, where** and **how** we work is less important





because enormously powerful collaboration tools are reshaping our work systems



and putting unprecedented power  
into the hands of individuals

"The younger generation are not passive recipients of mass consumer culture, they spend their time **searching, reading, scrutinizing, authenticating, collaborating, and organizing** (everything from their MP3 collections to protest demonstrations). The internet makes life an ongoing, massive collaboration, and this generation loves."

Wikinomics by Don Tapscott and Anthony Williams





added to changes in technology and the workplace are changes in **demographics**



“Generational workplace norms - **speed, freedom, openness, innovation, mobility, authenticity, and playfulness** - can form the basis of a revitalized and innovative workforce - but can also raise tough challenges for employers seeking to adapt to new expectations”

Wikinomics by Don Tapscott and Anthony Williams



companies are beginning to leverage the shift of **technology**, **demographics**, and **behaviors** in the workplace...



by creating new ways for people to volunteer their **time**, **energy**, and **expertise** to help accomplish their mission



The term "**enterprise 2.0**" is used a lot today in business to describe how organizations can implement novel technologies, provide software as a service, and use the web as a platform.

[Wikipedia.org](https://en.wikipedia.org/wiki/Enterprise_2.0)



Strategy Domain	Closed Corporation	Enterprise 2.0
<b>1. World View</b>	National Engine - US, Japan, Europe Protectionist	Global Engine - China, India, Emergent Free Trade
<b>2. Corporate Boundaries</b>	Vertically Integrated Non-porous Content M&A	Focused on Core Business Web Context, agency + Fasttrack Business Models
<b>3. Value Innovation</b>	Closed Innovation Do it Yourself	+ Open Innovation + Co-Creation
<b>4. Intellectual Property</b>	Proprietary Protected	+ Open + Shared
<b>5. Modus Operandi</b>	Plan and Push Hierarchical Power over ... Lumbering	Engage and Collaborate Self-organizing Power through ... Agile
<b>6. Business Processes</b>	Internal (Enterprise Integration) Complex Hardwired	External (+ Inter-enterprise Integration) Modular Reconfigurable
<b>7. Human Capital &amp; Knowledge Capital</b>	Traditional Demographics Containerized Internal	+ Global N-Generation Collaboration + Across the B-web
<b>8. Information Liquidity</b>	Opaque Asynchronous processing Traditional BI	+ Transparent Real Time Networked Intelligence
<b>9. Relationships</b>	Transactions Product/Services	+ Relationship Capital + Experiences
<b>10. Technology</b>	Proprietary Monolithic Silos Enterprise Dumb Networks	+ Standards-based Service oriented Interoperable + Inter-enterprise Intelligent Networks

**“enterprise 2.0”**  
is re-inventing the way work is done



the challenge for organizations  
**is to build or utilize new work systems**  
that take advantage of the larger global shifts

**II**

# the engagement gap

today, a large number of people are looking to  
make a difference in an **organization** that  
makes a difference in the **world**



people want to be **engaged**

but are we engaging our workforce?

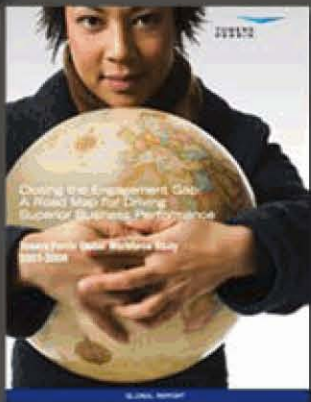


"Most companies can barely manage to research the fundamental disciplines that contribute to their products, let alone retain the field's most talented people within their boundary. So to ensure that they remain at the forefront of their industries, **companies must increasingly open their doors to the global talent pool that thrives outside their walls.**"

Wikinomics by Don Tapscott and Anthony Williams



TOWERS  
PERRIN



Towers Perrin surveyed 90,000 employees in 18 countries and focused on drivers of attraction, retention, and engagement in the workplace



**connection to the organization measured across three dimensions**

**rational:** how well employees understand their roles and responsibilities  
*(the "thinking" part of the equation)*

**emotional:** how much passion and energy they bring to their work  
*(the "feeling" part of the equation)*

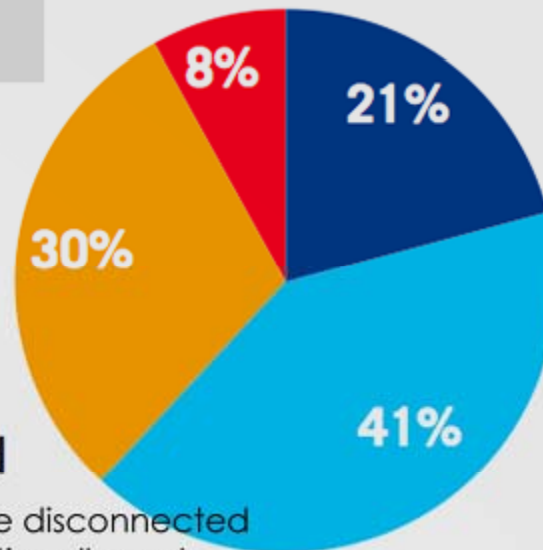
**motivational:** how well they perform in their roles  
*(the "acting" part of the equation)*



**TOWERS  
PERRIN**

the partly disengaged, with lower scores on all three components of engagement, especially the emotional connection

**Disengaged**



**Engaged**

those giving full discretionary effort, with high scores on all three dimensions

**Disenchanted**

those who have disconnected rationally, emotionally and motivationally

**Enrolled**

the partly engaged, with higher scores on the rational and motivational dimensions, but less connected emotionally

As *Exhibit 1* shows, only a fifth of the respondents in our global study can be categorized as engaged. The largest segment, over 40%, is the so-called "enrolled," perhaps best described as capable but not fully committed. The remainder are either disenchanted (almost a third of the total) — likely doing the minimum to get by — or completely disengaged. (For a look at engagement levels across the countries in our study, see Appendix B, page 21.)

Put another way, almost four out of five workers are not living up to their full potential or doing what it takes to help their organizations succeed. More disturbing still, almost two out of five (the disenchanted and disengaged) have already "checked out" to some extent. For employers, the implication is clear: They are not harnessing the full power of their workforce and achieving the performance lift that high engagement delivers.

The size of this gap would be disturbing at any time. But it is particularly so today for two well-documented reasons:

- The global knowledge-based economy is increasingly dependent on people and their knowledge, skills, energy and dedication.
- Demographic trends suggest looming shortages of key skills across industries and regions of the world — raising the risk of losing sought-after talent and dealing with the consequences of managing a significantly disengaged or disenchanted population.

Because of these challenges, continued business growth today often depends on maximizing the contribution of virtually every employee, and certainly the cadre of talent most critical to ensuring that an organization's products and services consis-



**TOWERS  
PERRIN**



TOWERS  
PERRIN



The study found that companies with the highest levels of employee engagement achieve better financial results and are more successful in retaining their most valued employees than companies with lower levels of engagement



TOWERS  
PERRIN



The study found that organizations have a surprisingly pivotal role to play in developing an engaged workforce if they focus on the right things

vary by country (see Appendix B, page 21), as well as by various demographic factors like age, senior management's ability to demonstrate genuine interest in employees is the top engagement driver not only globally, but in at least seven countries, and is on the top 10 list in all but six countries. This finding speaks to the enormous influence that a company's top leaders have on their extended global teams, even among people they have never met and may never meet.



**TOWERS  
PERRIN**

## **Top 10 Drivers of Employee Engagement Globally**

- 1. Senior management sincerely interested in employee well-being**
2. Improved my skills and capabilities over the last year
- 3. Organization's reputation for social responsibility**
4. Input into decision making in my department
- 5. Organization quickly resolves customer concerns**
6. Set high personal standards
- 7. Have excellent career advancement opportunities**
8. Enjoy challenging work assignments that broaden skills
9. Good relationship with supervisor
- 10. Organization encourages innovative thinking**

At its core, our current study confirms what most organizations know intuitively: Engagement is about the work environment and nature — even texture — of the work experience. It is about the unique intangibles that effective leaders create and sustain. We deliver value to customers and communities

people around the world want to  
invest their skills and knowledge on  
behalf of their employers

yet few organizations are fully taking  
advantage of this strategic opportunity

organizations have a **major opportunity**  
if they can align their business strategies  
and engage the global workforce

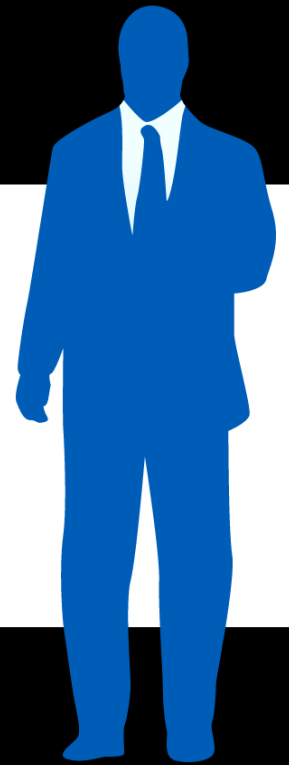


**III**

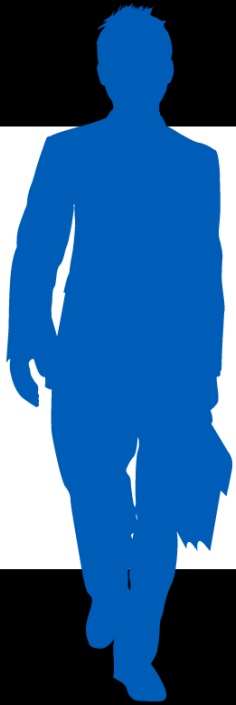
**user contribution systems**

**“Traditional hierarchies still exist.** Bosses still expect to be bosses.  
Command and control is alive and well.”

Jeff Pfeffer, Stanford Graduate School of Business



how do we forge a **new work system**  
to engage global talent?



“Business performance in an information society means knowing how to **mobilize collective intelligence.**”

Olivier Zara, Axiopole

shared design  
open innovation  
open architecture  
producer innovation  
autonomous innovators  
embedded open toolkits  
distributed innovation systems  
cooperative resource exchange  
open source science and research

## **user contribution system**

community based knowledge systems  
amplified intelligence technology  
collaborative user communities  
user developed innovation  
collaborative innovation  
collective intelligence  
collective invention  
e-collective work  
crowdsourcing

The concept of user contribution isn't new, but companies have created user contribution systems. That is, they've created **methods for aggregating and leveraging people's contributions** and behaviors in ways that are useful to other people.

Scott Cook, Intuit Inc





**user**

employees, customers, or even people with no previous affiliation to the organization



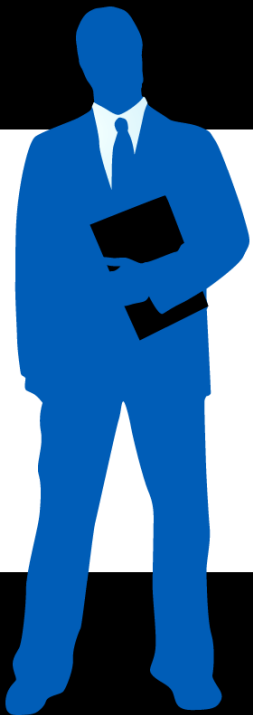
**contribution**

can be active (work, expertise, or information) or passive and even unknowing (behavioral data)



**system**

the method or platform, usually internet-based, by which contributions are aggregated and automatically converted into something useful to others



“Conventional wisdom says you should control and protect proprietary resources and innovations - especially intellectual property - through patents, copyright and trademark. Most industries still think this way. Today, **a new economics of intellectual property is prevailing.** Increasingly, and to a degree of paradoxically, firms in electronics, biotechnology, and other fields find that maintaining and defending a proprietary system of intellectual property often cripples their ability to create value. Smart firms are treating IP like a mutual fund - they manage a balanced portfolio of IP assets, some protected and some shared. ”

Wikinomics by Don Tapscott and Anthony Williams



**Manufacturer activity**

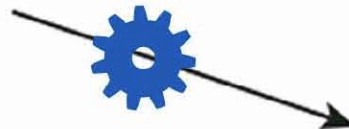
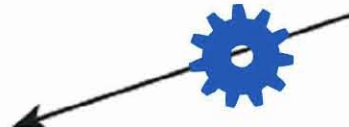
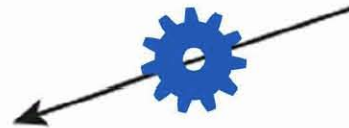


Manufacturer draws on local capability information to develop prototype responsive to specifications.



Manufacturer iterates until user is satisfied.

**User-manufacturer boundary**



**User activity**

User draws on local need information to specify desired product or service.



User draws on local need and context of use information to evaluate prototype.  
User changes specifications as needed.



User iterates until satisfied.



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External collaboration plays a key role in nearly 50 percent of P&G's products. We've collaborated with outside partners for generations but the importance of these alliances has never been greater.

Our vision is simple. We want P&G to be known as the company that collaborates — inside and out — better than any other company in the world.

- A.G. Lafley

Chairman of the Board and  
Chief Executive Officer

# Dell Idea Storm



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- Sales Strategies
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- Simplify and Save
- Small Business
- Software
- Studio products
- Vostro products
- Women's Interest
- XPS products



- POST** your idea for Dell products or services >
- PROMOTE** interesting ideas you want to see >
- DISCUSS** with Dell and other users >
- SEE** what we are planning to develop >

Sort By: Popular Ideas Recent Ideas Top Ideas Comments

**270** **Dell should indicate how long it takes to charge a battery from 0% to 100%.**  
By winOffice Oct 21, 2008  
When I configure a notebook PC, when I get to the battery page, I get something like this.  
6 cell, 29 Whr  
9 cell, 56 Whr  
Now that hardly gives me any information that is actually useful to me. I want Dell to indicate how long a 100% charge will last based on the notebook configuration (although that is covered already in another idea), but I also want Dell to indicate how long it takes to charge the battery FROM 0% TO 100%.  
Comments: 3  
Categories: Dell Web Site Laptop Power

**120** **Please let us edit our comments and ideas.**  
By badblood 12-34 PM  
We used to have the possibility to edit our ideas and comments, to refine them, or make corrections. Now we can't and that's a loss. Please enable us to do this again.  
Comments: 14  
Categories: IdeaStorm

**63460** **Provide Linux Drivers for all your Hardware**  
By georgz Feb 19, 2007  
I don't care whether the OS is pre-installed or not, I want all the hardware to be totally supported in the Linux kernel without in mucking around. I currently have a Dell M1210 and I wish the modern world would work, just in case I need it. The web cam would work, just in case I need it. At least the Intel wireless card is totally supported. Thanks Intel!  
**DELL Status Update**  
Drivers are available for Linux to make some but not all hardware work. We continue to work with our partners to provide for better hardware support. See more specifics from john\_h.  
Comments: 188  
Categories: Linux  
Status: In Progress

**90** **Make the idea viewing area a little bigger**  
By badblood 12-18 PM  
Some part of me likes the new goth look of ideastorm, but another thinks the idea writing and viewing area is too small. It would be nice if you move that enormous list of categories to the right under the other status boxes.  
Comments: 29  
Categories: IdeaStorm

**90** **Create a Mark All As Read link**  
By mkmaster78.9-29 AM  
I came in today to see over 90 New Recent Replies, but I do not want to go over each and every one, I don't have the time. What would be greatly appreciated is if a check box next to each comment could be placed and then some link that says Mark All Selected as (Read/Unread/etc) or at least a link that can mark all as read.  
Comments: 8  
Categories: IdeaStorm

**2650** **Mini 9 netbook Ubuntu price must be cheaper than XP price with same config**  
By ubondell Sep 4, 2008  
OK, one more time. Dell, please don't think we are stupid or dumb. Please put how to add

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### General Stats

The Dell Community has:

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Key topics: Personality and emotions, managing star performers, managing difficult people, 360-degree performance evaluation
- Engstrom Auto Mirror Plant: Motivating in Good Times and Bad**  
Key topics: Employee motivation, incentives, human resources management
- TerraCog Global Positioning Systems: Conflict and Communication on Project Aerial**  
Key topics: Intergroup conflict, managing communication, group processes, group structure
- Thomas Green: Power, Office Politics, and a Career in Crisis**  
Key topics: Power and influence, organizational politics, conflict management, managing your boss
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Key topics: Job satisfaction, employee retention, job design, labor relations

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#### Organizational Learning in the Face of Ambiguous Threats

Amy C. Edmonson, Michael A. Roberto, and Richard M.J. Bohmer

In this video clip, Professor Michael

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- InnoCentive CEO, Dwayne Spradlin.

[Read the recent press release](#) or visit the new [SAP Pavilion](#) and view the latest Challenges.

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Browse by style

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Last week / Next week



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The Discovery of Geometry by YASLY aka Danny Jones



Only \$18  
Heaven and Earth by Ai Dimarucot



From \$18  
Search and Rescue by Justin Cher



Only \$18  
Colorblind by Mathew Lopez



From \$18  
The Northern Black-capped Gumsucker by Brock Davis



Only \$18  
Demise of Mr. Flamingo by Adam Weber



From  
Beastly Planet by Richard A.



From  
Rock is dead and paper killed



Only  
Real bear hugs are often



From \$18  
Wanted by Jean-sebastien Dehooter



Only \$18  
Have Fun by Flak



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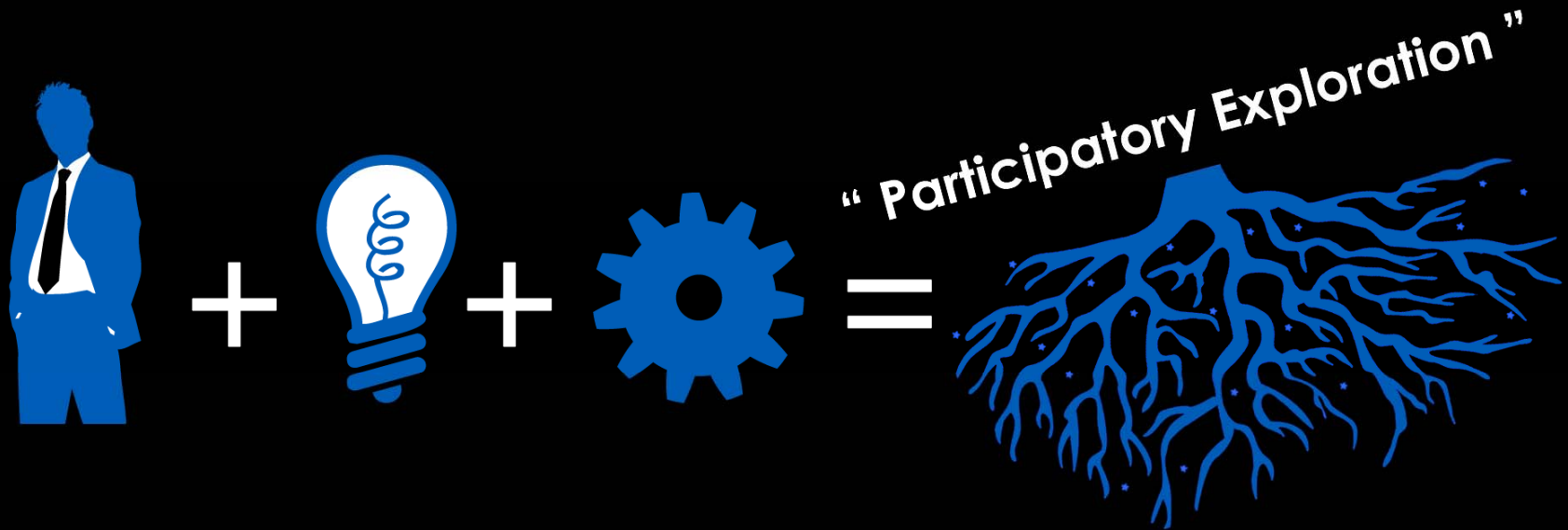
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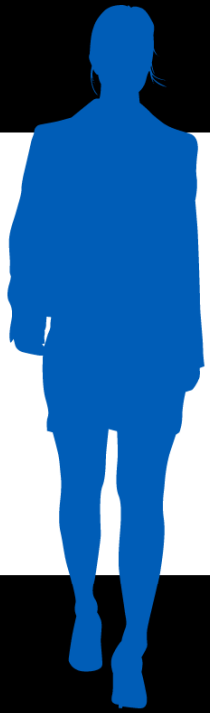
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at NASA, this could be what we call  
**“Participatory Exploration”**



“The leaders in innovation will be those who figure out the best way to **leverage a network of outsiders.**”

Gary P. Pisano and Roberto Veranti, HBR December 2008



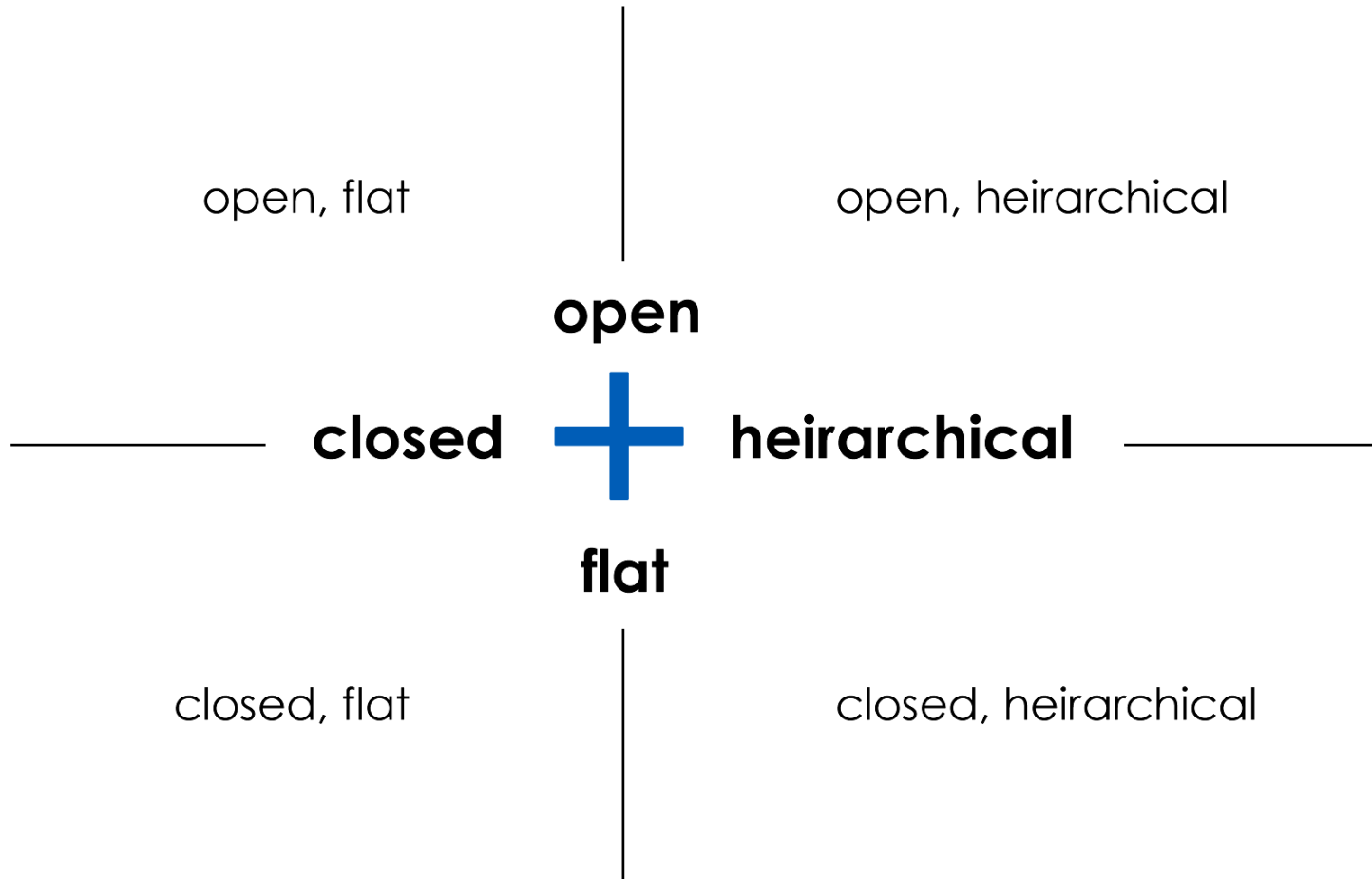


## 8 dominant collaboration patterns

- 1 screen for specific solution with knowledge where to find it; outsource innovation to external actor
- 2 openly search for solutions (observe communities); no direct interaction with external actors
- 3 screen for solutions; integrate with external holder and collaborate
- 4 post an innovation task openly to pre-defined group; external actors collaborate
- 5 post a problem to pre-defined external network of experts; self selecting problem solvers work independently
- 6 post a specific problem or idea, start a contest to a known pre-defined group; participants must be qualified
- 7 post a challenge or problem to undefined group; self-selecting problem solvers work independently
- 8 post ideas, tasks or do onlin brainstorm with broad unknown heterogeneous community; work collaboratively

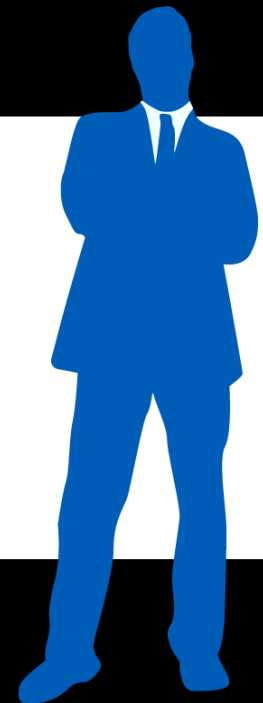


# which kind of collaboration is right for you?



“The participation revolution now underway opens up new possibilities for billions of people to play **active roles** in their workplaces, communities, national democracies, and the global economy at large.”

Wikinomics by Don Tapscott and Anthony Williams



**IV**

**a case study**

**open  
source**

**digital  
astronaut**

**Spaceflight**

XML  
Project Plan

Circulatory

Cells

Internet

collective intelligence

Respiratory

Orchestrator

Physiology

Tissues

Endocrine

Neurologic

community

Environmental

Knowledge

Science Plan

Scalability

distributed innovation  
Roadmap  
Whole Organism

Simulation

Metabolic

Excercise

Innovation

intellectual property

Pharmacology

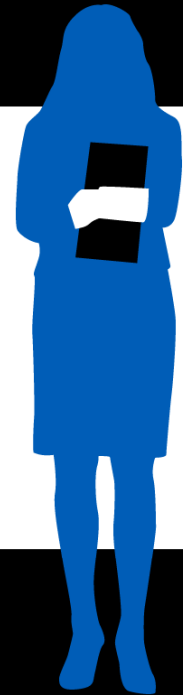
Organs

Gastrointestinal

Data

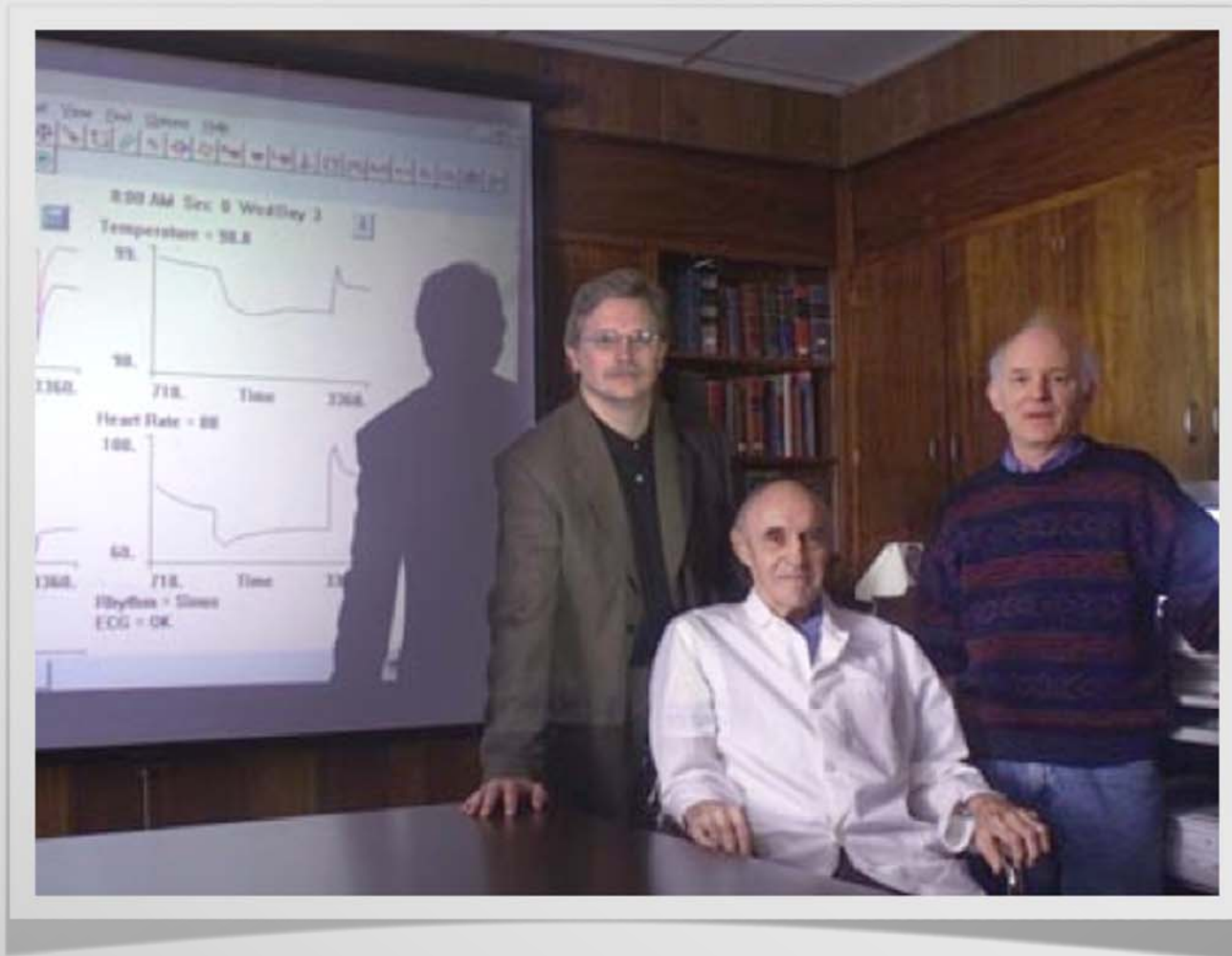
“No matter who you are,  
**the smartest people work for someone else.**”

Bill Joy, Sun Microsystems



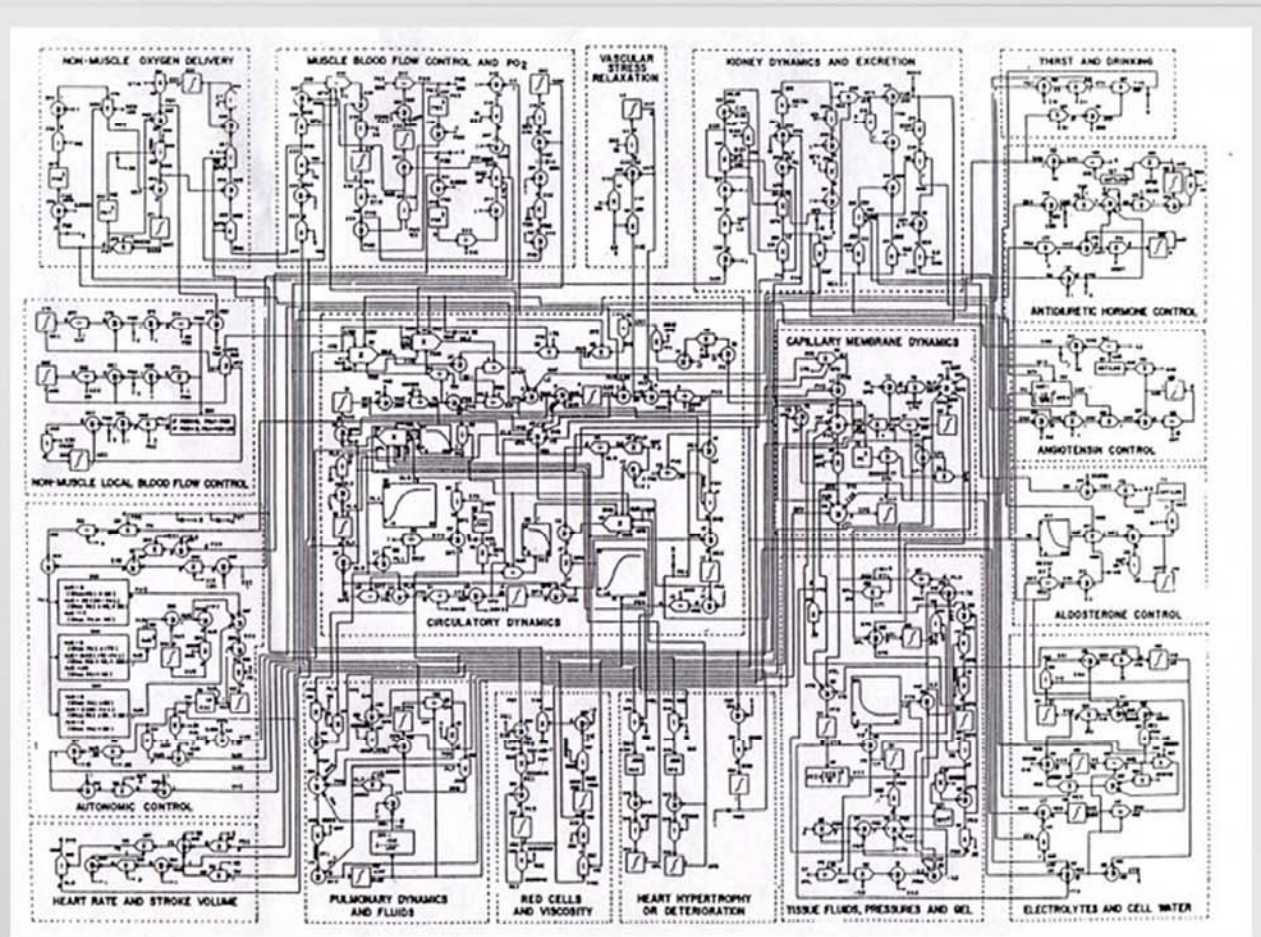
## **digital astronaut**

a sophisticated compendium of knowledge and computational modeling tool that can be used to construct predictive simulations of human body system

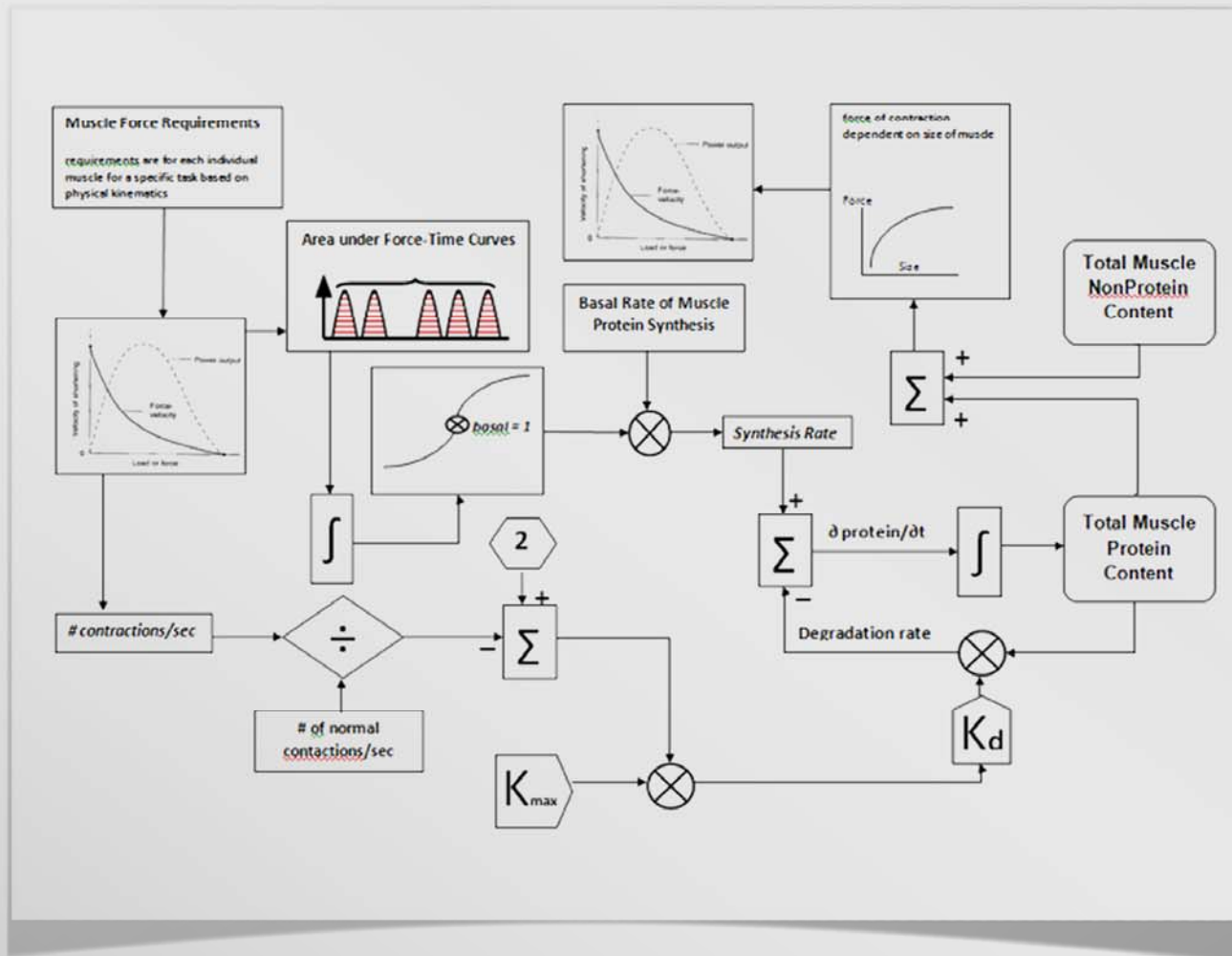


developers of the quantitative physiology model  
Guyton, Coleman, Summers at the University of Mississippi Medical Center

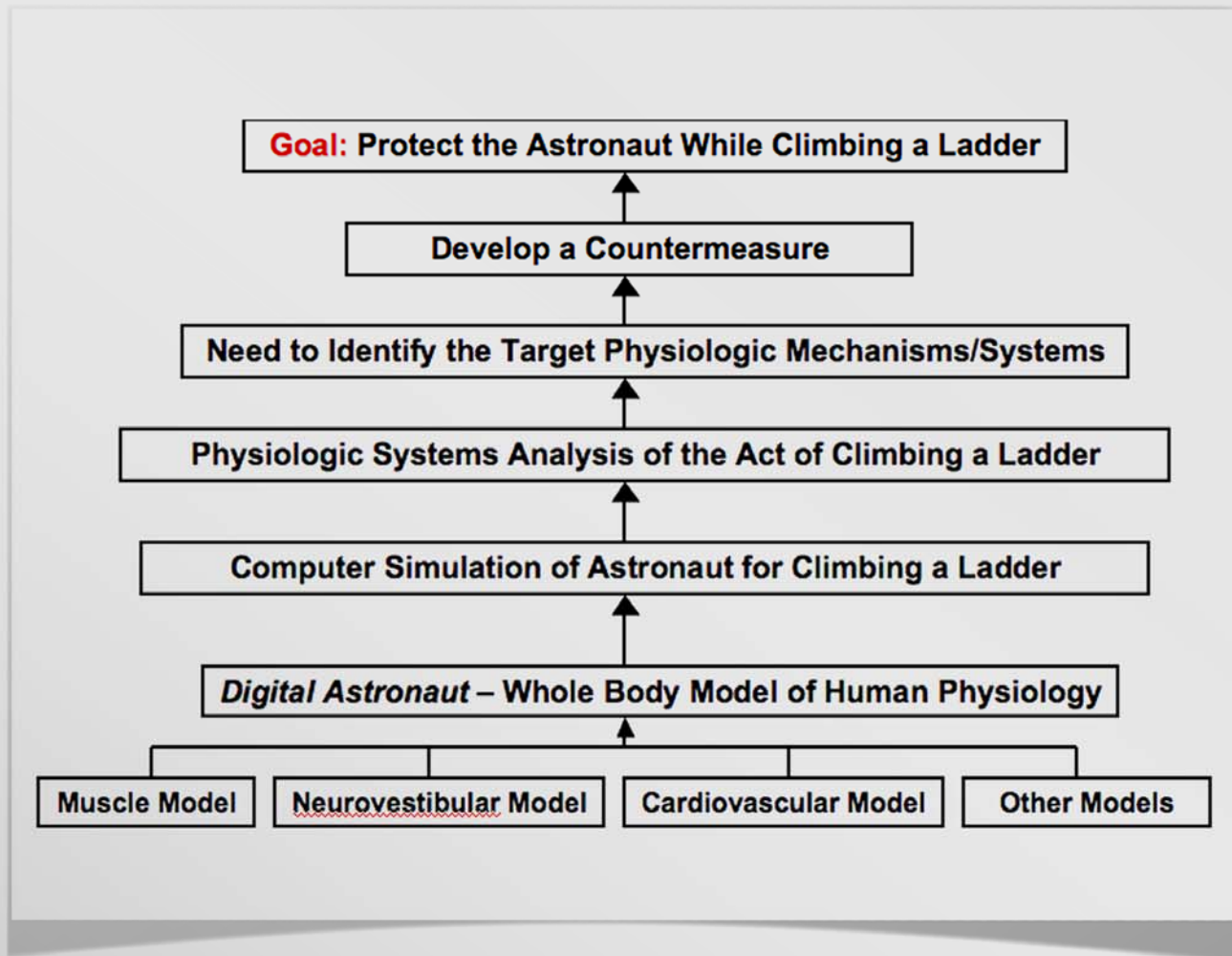




original model schematic



detailed schematic for spaceflight induced changes in skeletal muscle size



how the digital astronaut supports other space life science projects



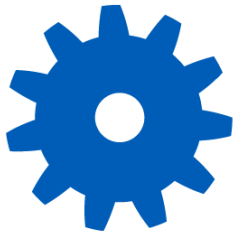
## **user**

scientists, academia, medical industry, gamers, artists, engineers, students, etc.



## **contribution**

science knowledge  
research data  
software development  
data manipulation  
model simulations

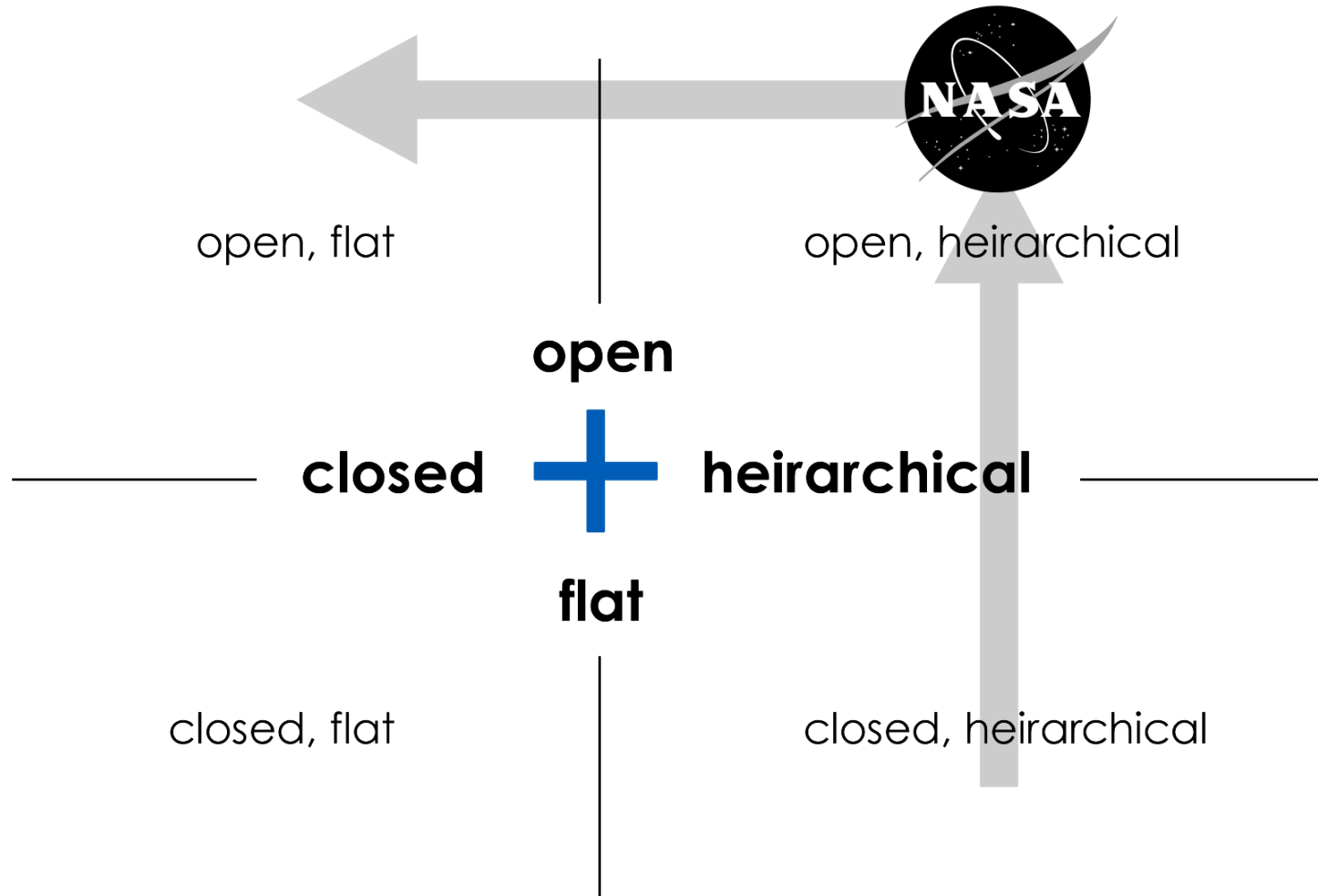


## **system**

XML based model and modules, along with toolkit, offered via the internet. Website to aggregate knowledge, data, and model simulations



# digital astronaut collaboration style



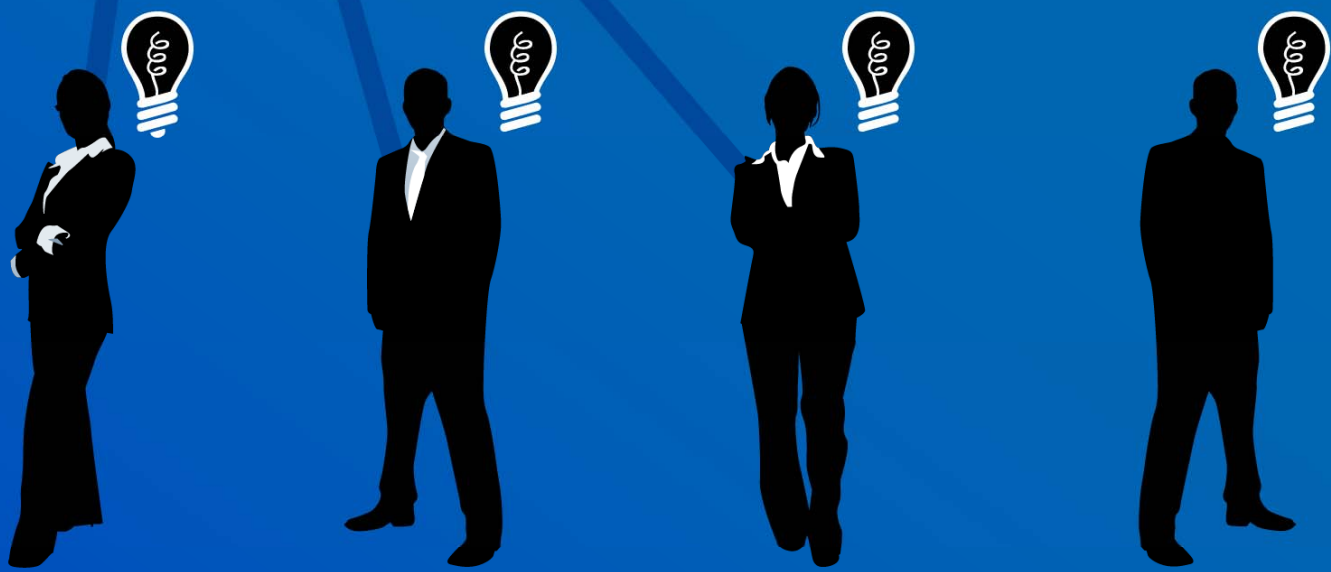


nasa.gov / **digitalastronaut**

model download  
software development

data and simulation center  
community

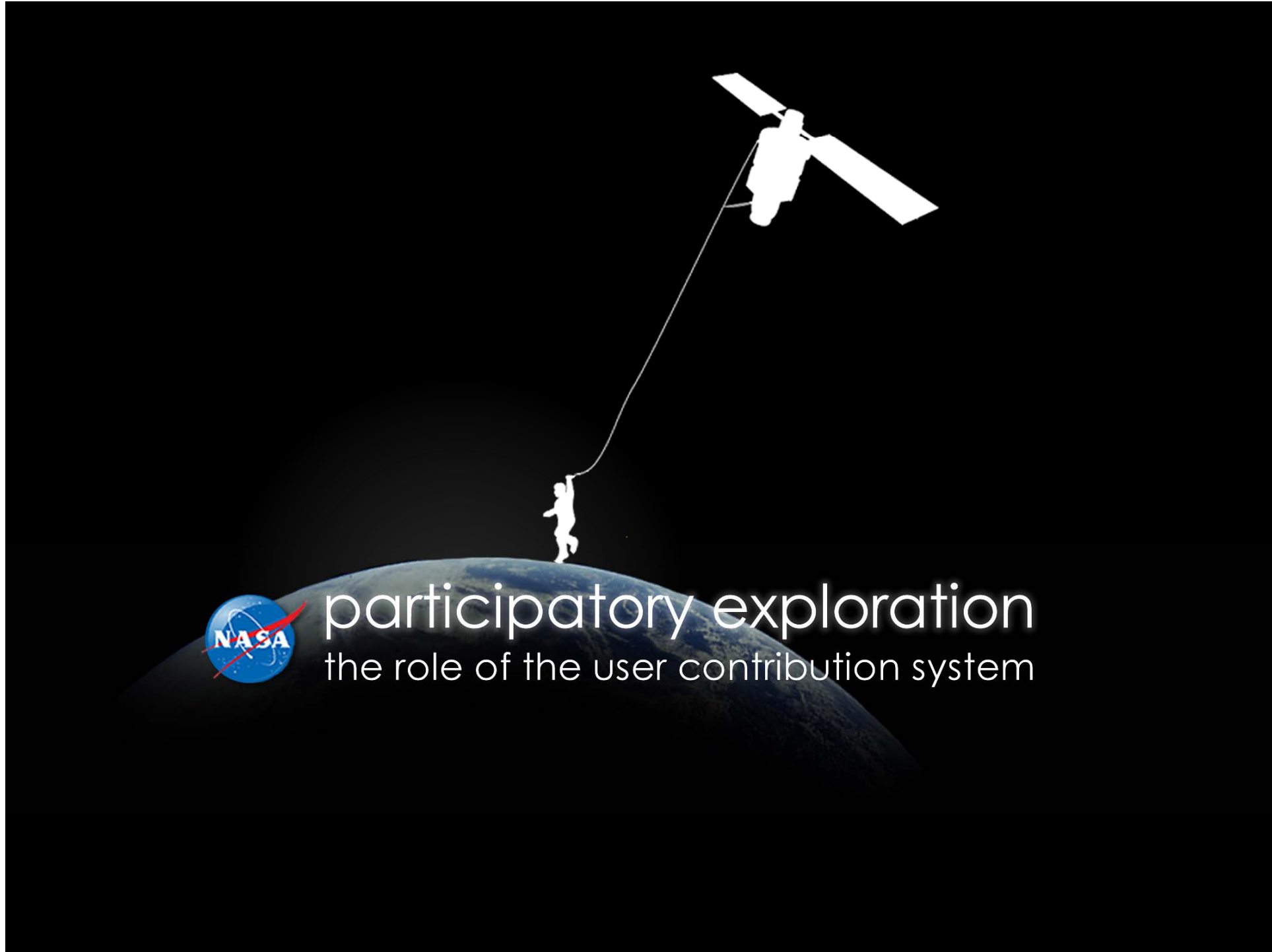
science plan  
compendium of knowledge





# participatory exploration

the role of the user contribution system





# participatory exploration

## the role of the user contribution system

nicholas skytland

[twitter.com/skytland](https://twitter.com/skytland)

[nicholas.g.skytland@nasa.gov](mailto:nicholas.g.skytland@nasa.gov)

Nicholas Skytland is a project manager at NASA working on two projects - the EVA Physiology, Systems and Performance Project (EPSP), as well as the Digital Astronaut Project, within the Space Life Sciences Directorate at Johnson Space Center (JSC). His work includes developing an open innovation framework within NASA to offer individuals, academia, companies, and others the opportunity to directly contribute to space exploration.

Skytland holds a master's degree from the International Space University in Space Studies and a bachelor's degree from Valparaiso University in Mechanical Engineering. He is currently pursuing an MBA degree at the University of Texas.



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- \* special thanks to Karen lau for artwork on slides **[1] [71] [87]**
- \* special thanks to Dr. Richard Summers and the Department of Physiology at the University of Mississippi Medical Center for images and information on slides **[79-83]**
- \* special thanks to Corey Billington, Professor of Operations Management and Procurement at IMD, for discussion on the evolution of work, January 2009



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from other presentations

**[14] [29]** image: slide 8 and 27 of "*Government 2.0*" presentation respectively,  
<http://www.slideshare.net/remarkk/mesh-metronauts>

**[26] [41]** data table: slide 2 and 3 of "*Wikinomics - Winning the Enterprise 2.0*",  
<http://www.slideshare.net/mqaisaunee/wikinomics-winning-with-the-enterprise-20>

**[73]** 8 collaboration methods: slide 7 and 8 of "*Facets of Open Innovation: Development of a Conceptual Framework*" by Katheleen Diener, presented at the Harvard User and Open Innovation Workshop, 5 August 2008

from the *2007 Towers Perrin Global Workforce Study*

**[34] [48-53]** Information and images: *Towers Perrin Global Workforce Study, 2007*; Available at  
<http://www.towersperrin.com>

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### journal articles

[74] [85] data table: "Which Kind of Collaboration is Right for You?" by Gary P. Pisano and Roberto Verganti, Harvard Business Review, Dec 2008. Reprint R0812F, <http://www.hbr.org>



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