Innovation in Medicine: It’s not Rocket Science

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Disclaimers

- We didn’t invent Velcro.
• We didn’t invent Tang either...
Innovation at NASA

- Sometimes we do invent stuff.
- But more often we take idea or products and modify it in ways folks did not imagine.
- When was the fuel cell invented?

1839 Sir William Robert Grove

United Tech
For the Apollo Program

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Who invented solar energy? When?

1839 Antoine Cesar Becquerel
Other examples of Innovation

- Who invented Stealth technology?

1964 Russian Physicist and Mathematician Pyotr Ufimtsev
• Just what is **Innovation**?
• Google “innovation” and you get 102,000,000 hits. By contrast, google “ethics” and you get 83,000,000 hits.
• Is it new ideas? Is it “out-of-the-box” thinking? Is it inventing that which has not been invented yet?
• Is it trying to stay fresh, ahead of the curve, anticipate the inflection point.
“Wealth in the new regime flows directly from innovation, not optimization; that is wealth is not gained by perfecting the known, but by imperfectly seizing the unknown”.

- Kevin Kelly,

New Rules for the New Economy, Wired
“The term innovation refers to a new way of doing something. It may refer to incremental and emergent or radical and revolutionary changes in thinking, products, processes, or organizations”.

- Wikipedia
"Capital isn't so important in business. Experience isn't so important. You can get both these things. What is important is ideas. If you have ideas, you have the main asset you need, and there isn't any limit to what you can do with your business and your life."

— Harvey Firestone
"It's easy to come up with new ideas; the hard part is letting go of what worked for you two years ago, but will soon be out of date."

— Roger von Oech
Top Barriers to Innovation

10) Criticize new ideas
9) “Not invented here” phenomenon
8) Treat brainstorming like a 60’s sit-in
7) Focus on efficiency, not innovation (although you can use innovation to become more efficient)
6) Hoarding problems, hoarding resources, hoarding ideas
Top Barriers to Innovation

5) Punish mistakes
4) Promote the clones
3) Diminish training and education
2) Overwork the few
1) “It’s the way we have always done it”.

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NASA and Innovation

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Being Inclusive - Team 4 Innovation
The SIX Tenets

- MASS
- POWER
- VOLUME
- TIME
- MONEY
- RISK

Polk’s Law: If you want your medical project to succeed, it should not increase more than two of these, and preferably should reduce at least one.
Lean Six Sigma

- Clinical Practice Guidelines
- Care Managers
- Selection Standards
- Vehicle specific standards
- Fitness for Duty Standards
Preventive Medicine
Practicing Offensive Preventive Medicine

- Screening: ex-EBCT/CRP
- Preventive Medicine: Statins and A-1 Milano HDL therapy
- Operational Standards
- Fitness for Duty
- Medical Requirements
- Bioastronautics Research
- Medical Studies: Evaluating current therapies, predicting future problems
- Result for Exploration Medicine
  - Reduced risk of coronary event to less than 1%
  - Reduced volume of meds and hardware
  - Massively reduced risk
  - Reduced cost
  - Reduced Volume
Medical Innovation at NASA

- Closed Circuit
- Oxygen Concentrating
- Computer controlled
Medical Innovation at NASA

- New uses for ultrasound
- New protocols for ultrasound
- New techniques in remote and telemedicine

uses of ultrasound

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Medical Innovation at NASA

- New exercise equipment that monitors loading on muscle and bone
- Equipment that provides valuable metrics on strength and duration
PanOptic Hardware Innovation

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Medical Innovations at NASA
Medical Innovations coming from NASA technology

- JPL software used to study subpixel images of planets (can distinguish 256 shades of gray at the micro pixel level)
- Tech used from Carotid Intima-Medial Thickness ultrasound to evaluate plaque.

Arteriovision CIMT
### Open Source for Innovation

- **DigitalHuman**
- **University of Mississippi Medical Center**
- Open source code uses innovation from programmers on the outside to improve the modeling and code.

*From Scientific American*

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Benchmarking

Superior Health Care

Reduce Waste

Improve Efficiency

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Benchmarking

- Astronaut Health Care
- Executive Health Physicals
- Occupational Surveillance
- Studies on Aging
Medical Innovation at NASA

Global Standardized Medical Records Access Using the “Cloud”

Photo by google.com

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Contingency Innovation

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HUNCH—High Schools United with NASA to Create Hardware

Need:
CHeCS rack in SSTF

Challenge:
Cost prohibitive

Approach:
Partner with local high schools

Result:
Racks delivered
Students prepared for careers and college (TVIS and ARED)
Additional projects completed (TVIS and ARED)

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Futuristic?

EKG in Heads Up Display

Actually, It has already been done

CPOD, NASA Ames

NASA Houghton Mars Project

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Metrics...because Innovative ideas without outcomes are just ideas...

- Time Saved
- Money Saved
- Quality Improvement
- Process Improvement
- New Business

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Forecasting and Responding to Inflection Points

- Technology
- Changes in Practice
- Changes in Funding
- Changes in Destination
- Changes in Mission
- Changes in Management
Unique Aspects of Moon and Mars Missions

- Distance
- In-situ production of consumables
- Relative Autonomy
- Communication
- Power production
- *Reversal of Life, Limb, Mission paradigm*
It’s not the Destination…it’s the Journey that causes us to Innovate

Ok…maybe it’s both. But avoid complacency.

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“Innovation distinguishes between a leader and a follower”.
- Steve Jobs
The death of your industry begins when innovation stops...

“Without tradition, art is a flock of sheep without a shepherd. Without innovation it is a corpse”.

– Winston Churchill