

Innovation and Human-Centered Design

Unlocking public health and food science for the 21st Century

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Key messages

- > Innovation is both a process and its outcomes: it transforms and implements insights, ideas, and inventions into applications that have either incremental or radical impact and hence create value for the relevant unit of adoption.
- > Innovation is challenging in general and specifically in nutrition and public health; the path from idea to impact is full of challenges and pitfalls.
- > Human-Centered Design has evolved from an approach to new product development in design firms to become the dominant philosophy and methodology for innovation and creative problem-solving across industries and sectors – and is particularly relevant to food innovation and public health problem-solving.

Innovation in public health and nutrition: strategy or cliché?

Innovation is hardly a new phenomenon in the fight against malnutrition. Undernutrition and, now, overnutrition remain some of the most challenging domains of public health – requiring novel strategies that integrate a deep understanding of the

affected populations, risk factors, and contextual insights on how interventions might “fit” and be sustained. As populations continue to grow and the urgency of meeting the Sustainable Development Goals becomes more pressing, deconstructing the science and serendipity of innovation has become more important – often taking a central role on the agenda of institutions dedicated to solving intractable nutrition and public health challenges.

The term *innovation* is sometimes considered blurry, fuzzy, nebulous and even empty.^{1,2,3} The absence of a comprehensive yet simple definition of the term, its overuse and misuse, and the hype around it have eroded, for many, its meaning.⁴ Still, we are continuously reminded that innovation is thriving when disruptive items like the incandescent bulb, barcodes, electric vehicles, or even smartphones move from science fiction to market reality.

What is “innovation”?

Plenty of attention has been given to this question in the academic literature and the media.^{5,6,7} Let us begin with a few dominant definitions of “innovation” from which we will work towards our own interpretation of the term.

- > Innovations have a substantial economic impact. An innovation is something that changes the marketplace in a profound way. The innovating organization is, therefore, likely to become the new market leader and to gain a substantial advantage over its competitors.⁸
- > Innovation is “the generation, acceptance, and implementation of new ideas, processes, products, or services.”⁹
- > Innovation is something different that has impact.¹⁰

Taken out of context, these definitions seem to focus on innovation as an “end”, that is, innovations being the end product. A deeper analysis is necessary to grasp the fact that the term

innovation is a paradox: Does innovation refer to the outcome of, or to the *process* of, innovation?^{2,11} We argue that the conceived new is not only what matters, but also the *process* which leads to the *new*. If we consider that, according to Rogers and Aderhold, an innovation is only validated when it has been *commercially* successful, defining innovation becomes more complex.^{12,13}

Johannessen and colleagues postulated that in order to isolate a useful definition and measure of innovation, it is necessary to address three dimensions of newness: *what is new*, *how new*, and *new to whom*?¹⁴ Innovation can thus be seen as “three-dimensional.”¹⁵ When explicitly specifying *what is new* (i.e., the actual result of the innovative process), many of the indicators used measure the innovative *process*, not its *outcome*. For example, the total expenditure in R&D, number of patents, or number of product launches are just proxies that have limited face value and promote a narrow view of innovation.¹⁶ To illustrate this, simply consider that, by some estimates, only about 3% of new consumer product launches generate revenue exceeding US\$50 million¹⁷ and the vast majority fall short of their original sales projections.

Incremental vs. radical innovations

If something is deemed new, the seemingly obligatory question is: *how new* is it? The answer will be proportional to how “revolutionary” or disruptive of the status quo the new is: incremental innovations usually refine the meaning of an industry by focusing on doing things *better*, within the paradigm, and are often the re-implementation of a practice seen somewhere else. On the other hand, radical innovations represent a paradigm shift: they change the course of action by forcing people to do things differently.^{18,19,20}

New to whom?

The degree of newness of the object is a relative concept because it will depend on whose opinion is solicited. Previous research suggests that it depends on what is known as the “relevant unit of adoption” – i.e., the domain/field/universe/population by which the innovation is adopted.¹⁴ Within the context of this article, the relevant units of adoption might be populations suffering from malnutrition or who have impaired access to an adequate, nutritious diet. Context, in this situation, matters deeply – given the diversity in background levels of access to what might be considered radical innovation. Information technologies, such as the mobile phone and the internet, are heterogeneous in their global distribution. Whereas over 50% of the population in most Latin American countries enjoy internet access, that percentage drops to less than 10% in several sub-Saharan Africa countries.²¹ What might be radical today in one setting is already “last week’s news” in another.

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“What might be radical today in one setting is already ‘last week’s news’ in another”

What innovation is not

Having acknowledged the complexities of articulating a comprehensive, working definition of innovation, it is also important to describe what it is not.

> **Innovation is not invention.** In most cases, invention precedes innovation (because it is possible to innovate *without* inventing); however, not all inventions become innovations.¹ How many useless inventions do you know of? This is somehow expected as inventions are usually focused on technical and technological outputs, and *value creation* is often a secondary focus.¹

> **Innovation is not creativity.** Idea generation is definitely an important aspect of innovation, as ideas are the seeds from which innovations will be harvested. However, ideas must be tested for feasibility of execution, and even when feasible, aspects related to their economic viability, cost-benefit ratio, congruency with institutional values, and consumer acceptance are further hurdles that an idea must clear to demonstrate its potential for innovation.

> **Innovation is not just a process.** Methodologies and tools are obviously important to create an effective discipline and repeatable patterns for innovation. But at its core, innovation is a people-driven and people-centric phenomenon that relies on the mind, heart, soul, and creative spark of individuals and teams aspiring to create a better world.

We propose that “innovation” transforms and implements insights, ideas, and inventions into applications that have either incremental or radical impact and hence, create value for the relevant unit of adoption.

Challenges in mobilizing innovation

Notwithstanding the rapid proliferation of maternal, newborn, and child health innovation initiatives and substantial funding, innovation has yet to be fully integrated within global health. Emerging solutions rarely pass the pilot stage or else they get siloed within single organizations, unable to achieve scale and impact.²³ This is not surprising since, by definition, innovation seeks to reorder society (or sections thereof): it quickly comes into conflict with the need to maintain continuity and inevitably



Golden Rice (right) next to regular white rice.

© Golden Rice Project

runs headfirst into institutional inertia. Thus, the challenge and resistance to innovation is in direct proportion with the value and entrenchment of whatever the innovation makes obsolete.²⁴ Humans are creatures of habit.

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“People are very open-minded about new things – as long as they’re exactly like the old ones”

Charles Kettering

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Innovation in public health is particularly challenging, as the interrelationships between culture, politics, legislation, social habits and practices, and economics are subtle yet highly reactive to change. Many worthwhile nutritional interventions have failed to show impact not because of their intrinsic potential, but because of a lack of recognition of the above tensions. Few projects assess the potential **threat** inherent in a radical innovation. We shy away from acknowledging the beneficiaries of **dysfunction** – health system actors who benefit from low levels of scrutiny or accountability. These beneficiaries are not, however, necessarily malevolent – they may be tacitly relying on system inefficiencies to afford them financial or other advantages (e.g., per diem for travel to submit a weekly report, which may be displaced by an innovative digital data system).

The Golden Rice case: challenges and pitfalls of innovation

Golden Rice is unusual in that it was conceived in 1999 as a nutritionally enhanced food, with a biosynthetic pathway engineered to produce β -carotene in the rice endosperm. β -carotene is a vitamin A precursor, and the hope was that this novel variant of a global staple would mitigate vitamin A deficiency (VAD), which in extreme cases can cause blindness or death in young children.

Golden Rice offers an interesting case study of the challenges and pitfalls of innovation relevant to nutrition and global health. While industry representatives, scientists, and media voices argue that children are being left vulnerable to blindness or even “murdered” by Golden Rice critics, those critics counter by calling Golden Rice a foreign, overrated and misguided technology and a “Trojan Horse” meant to promote genetically modified crops in low- and middle-income countries (LMICs).^{26,27,28} Opponents have at times resorted to fear tactics by questioning its safety, while advocates have not always shown due appreciation for the local contexts – with their social, agricultural, economic, and cultural dimensions – which this innovation is designed to benefit.

Although Golden Rice may yet improve nutrition outcomes in LMICs in the long run, possibly aided by the growing recognition of the role biofortification can play in addressing micronutrient deficiencies, significant challenges persist. Consumers in many cultures have a strong attachment to the organoleptic properties of the rice they are used to consuming and may resist the idea

of consuming rice of a different color.²⁹ Questions remain about β -carotene retention over long storage periods and cooking, given its sensitivity to oxygen, light, and heat.³⁰ Last but not least, competing approaches to address VAD might ultimately prove more cost-effective, even in countries where rice is a primary staple.

Human-Centered Design: a potential game-changer in public health nutrition

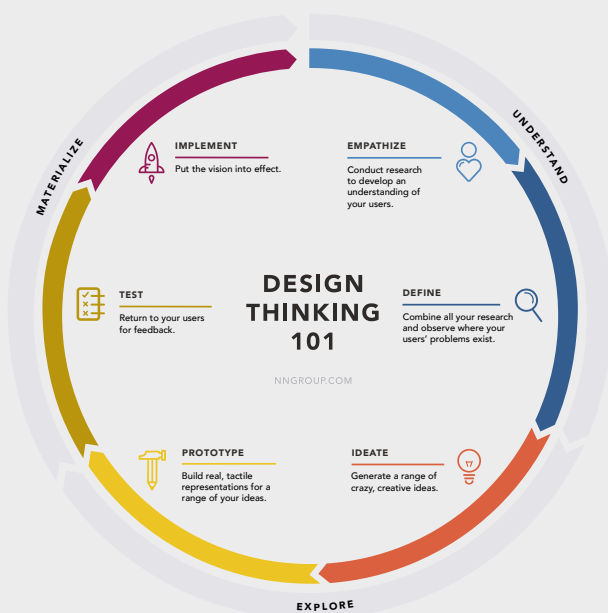
Because public health interventions inherently rely on human interactions at multiple levels in their design and implementation, any innovative solution-finding approach that places humans at the core of its process can thrive in the public health space. One such approach, Human-Centered Design (HCD) or Design Thinking (DT), was developed in Silicon Valley by designers who are credited with creating many of the naturally intuitive and compelling products that have revolutionized how consumers live – from something as simple as the first usable computer mouse to the precursor of the modern laptop computer.^{31,32} One proposed model suggests that the process consists of empathizing, defining, ideating, prototyping, testing and implementing (Figure 1); another argues that it consists of inspiration, ideation, and implementation.^{33,34}

Whereas qualitative research may be used in the context of a large-scale field trial to assess the acceptability of an intervention to increase adherence, HCD proposes that these methods should inform the design of the intervention itself.³⁵ Interviews and observations paint a picture of how stakeholders operate in their environments and how they perceive or interact with the problem being studied. In many circumstances, stories may reveal more about a problem than responses to structured interview questions. This multidisciplinary, predominantly qualitative process uncovers different angles that complement each other and create a holistic picture of a problem in its native context.

The qualitative nature of HCD is specifically aimed at understanding how consumers interact with a given problem, in their natural context; findings are then synthesized and common themes emerge. A critical point of the process is to translate themes into insights – statements that precisely identify the challenges and tensions that make up the design problem, and to flip insights into the opportunities that guide the right ideation process.^{34,36} These insights are incredibly valuable because they often generate non-obvious, relevant avenues for intervention that inform the development and implementation of other interventions beyond the minimum viable product or the original problem definition. An ideation stage is then entered to generate possible solutions (while also withholding judgment) and a rapid prototyping process then produces low-fidelity tangible manifestations of such solutions.³⁴ As prototypes are tested, feedback informs future, higher fidelity, generations of prototypes.³⁴ This process is illustrated in Figure 2. In terms of improving nutrition maternal and child nutrition in resource-poor settings, such an approach can be used, for instance, to design micronutrient supplements for pregnant women, or develop culturally-appropriate strategies to promote and facilitate exclusive breastfeeding.

HCD has evolved from an approach to new product development in design firms to become the dominant philosophy and methodology for innovation and creative problem-solving across industries and sectors. HCD is particularly relevant to food innovation given the deep contextual and sociocultural aspects of food, as well as its complex attribute patterns and the multiple roles food plays for consumers.³⁷ The public, social, and academic sectors stand to become more effective in their innovations for health, socioeconomic, and environmental impact as they fully incorporate HCD in their worldview and practices.

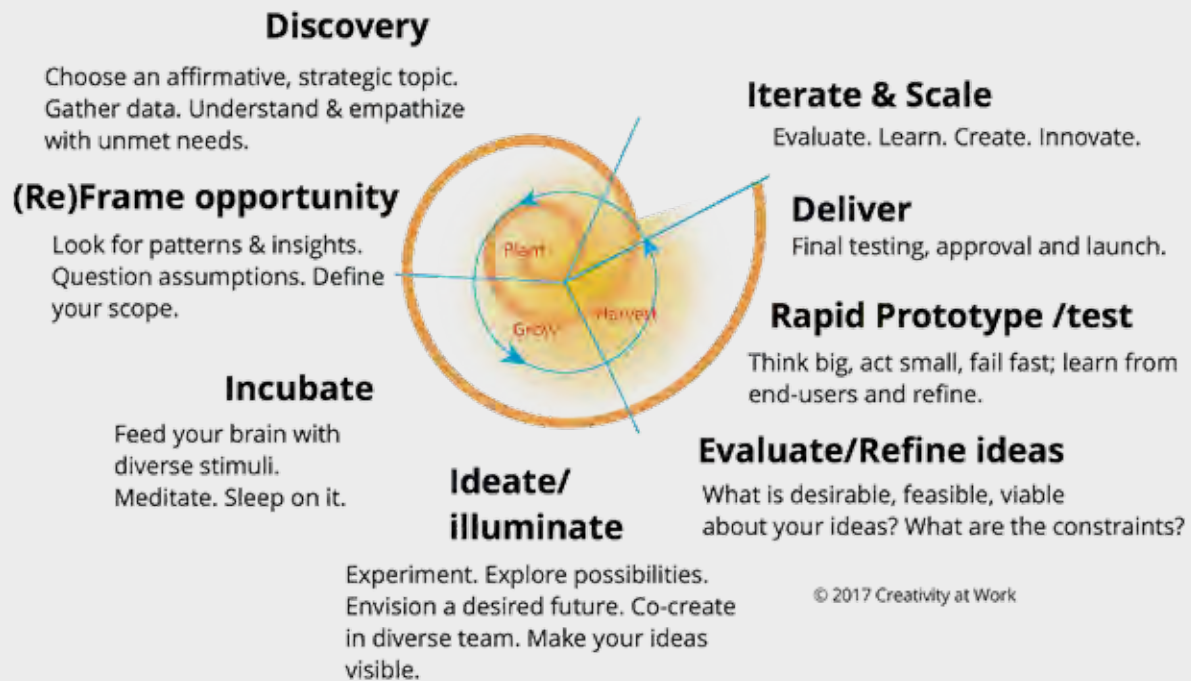
FIGURE 1: A cyclic framework of Design Thinking proposed by XYZ



Source: Gibbons S. Design Thinking 101: Nielsen Norman Group; 2016 (4 June 2018).

Available from: www.nngroup.com/articles/design-thinking/ (as per reference 33).

“Human-Centered Design is a highly relevant approach to public health problem-solving”

FIGURE 2: The iterative process of Human-Centered Design

Source: With permission from Linda Naiman © 2016 CreativityatWork.com

HCD is, in particular, a highly relevant approach to public health problem-solving. Global health programmers remain frustrated by the slow pace of adoption of proven innovations, of solutions of known efficacy. Despite growing mountains of data, evidence-based practices seem to take years, if not decades before they are mainstreamed – especially in populations where these practices are likely to have the greatest impact. Scaling up innovations is unquestionably a complex problem – with challenges that range from enabling policy to financing. However, the imperative of a systematic, scientific approach to understand and incorporate contextual and human factors at the very earliest stages of problem-solving and innovation is addressed by this emergent, formal approach. Although earlier incarnations of formative research (e.g., participatory development, embedded design) may seem similar, today's HCD offers to the public health world systematic tools and processes that have been honed over decades in the private sector. Like their commercial counterparts, public health innovations should seek to be not only feasible and viable in the context they are to be deployed, but also **desirable** by those who are to use and benefit from the interventions being proposed.

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