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Lost in Innovation: How Can Academic Research Have an Impact on Society?

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Abstract - **Academics are very good at producing high-impact scholarly publications. They are responsible for educating the next generation of scientists, researchers and practitioners. And they also conduct research. While academic education is desirable and essential, it is not sufficient to survive in today's society and innovation-driven economy, where ICT and Internet technologies have given birth to unprecedented organizational and individual levels of combinatorial innovation for the re-imagination of every single industry. Traditionally, there has been a gap between academic research and innovation due to serious realization issues, leaving most research results, inventions, and patents stranded. It is expected that tangible benefits to society will become increasingly important due to an increased focus on public return on academic research investment, a trend also being witnessed by the first innovation challenge panel/pitchfest hosted at IEEE's flagship conference INFOCOM 2016.**

This paper aims at empowering academics to bridge the gap between research and innovation by discussing its sources, introducing the concept of entrepreneurial design, and providing a tutorial of some of the most promising innovation skills, techniques, and strategies, including the blue ocean strategy canvas and four actions framework, the lean thinking based build-measure-learn feedback loop and minimum viable product, the Pro-Am revolution, as well as different emerging types of open user innovation, collaborative innovation, and frugal innovation. The paper also provides an outlook on the future expectations of science for achieving an increased societal impact by tackling not only technological but also so-called Grand Societal Challenges via decentralized bottom-up strategies.

Keywords: Academic Research, Innovation, Bottom-up Strategies

I. INTRODUCTION

RECENTLY, in December 2015, the Natural Sciences and Engineering Research Council of Canada (NSERC) launched NSERC 2020, its strategic plan for the next five years. NSERC 2020 sets out a vision to make Canada a country of discoverers and innovators for the benefit of all Canadians. Among others, it makes the following two important observations. With just 0.5% of the world's population, Canada generates 5% of scholarly publications, many of them high impact. In contrast, Canada's reputation lags when it comes to innovation. Thus, while Canadian scholars are apparently very good at publishing academic research results, they seem to suffer from a lack of innovation.

Canada doesn't seem to be the only country having this problem between research and innovation. The European Union (EU) is turning into an Innovation Union. Earlier in 2013, the EU published a pamphlet titled "Innovation Union: A pocket guide on a Europe 2020 initiative." The Innovation Union initiative forms part of the Europe 2020 strategy and aims to make Europe a world-class performer in science, whereby Horizon 2020 serves as the financial instrument to implement the Innovation Union with the overarching goal of coupling research and innovation, which apparently have been largely decoupled in the past.

The Innovation Union is conceived as the solution to many challenges Europe is facing, notably the creation of job opportunities for all, especially the young, and making companies more competitive in the global market. However, innovation *per se* will not be sufficient. The Startup Europe Leaders Club, a group of founders of successful web companies such as Spotify providing guidance to the European Commission, advocate in their manifesto for entrepreneurship and innovation to power growth in the EU [1] that despite the fact that Internet technologies are no longer confined to high-tech businesses and are resulting in the re-imagination of every single industry, holding the promise of creating new jobs and new wealth, the days of relying on large businesses or the government for job creation are over, with many of the jobs lost over the past years never returning in their old form.

The authors of the manifesto mandate a mentality shift across Europe by promoting the path of entrepreneurship as a credible career alternative and democratizing the tools and processes of starting new businesses. Similarly, Gallup's CEO Jim Clifton warns that the United States and much of the rest of the world are trying to boost innovation while entrepreneurs are neglected [2]. According to Clifton, the United States has no shortage of great ideas and innovations, but the country

This work was supported by the NSERC Discovery Grant Programme

most needs entrepreneurs who can turn those ideas into great businesses and thus create millions of new jobs in small and medium-sized startup companies. Or as he puts it, what is needed most is "a society that encourages people to go into a wilderness and then buys what they bring back."

This call is echoed by academic researchers such as Erik Brynjolfsson and Andrew McAfee from MIT, who in their recent book on the dawn of the Second Machine Age [3] call for entrepreneurship as an innovation engine and a prime source of job growth and for the creation of wild ideas. To answer this call, however, it will be equally important to listen to contrarian entrepreneurs such as Peter Thiel, who has famously dismissed university as a waste of time and money and was once even dubbed "university-hater" in a Reuters article.[1] As a matter of fact, Thiel's recently launched Breakout Labs program aims at helping turn wild ideas into world-changing technologies and supporting PhD-entrepreneurs who want their science to have a direct impact on society beyond academic publishing and its own metrics of success. Tangible benefits to society will become increasingly important due to an increased focus on public return on academic research investment, where applicability has become a key metric in many research proposals, and the fact that companies have scaled down their own R&D operations.

This paper aims at bridging the gap between academic research and innovation by shedding light on the missing link between a rough first idea, invention, research result, new technology, or patent and its eventual market acceptance. The paper puts an emphasis on recent innovation techniques developed outside academia in order to help scholars embark on a mentality shift towards teaching essential innovation skills and embracing entrepreneurship as an innovation engine and thereby having a more tangible impact on society beyond academic publishing *per se*.

The remainder of the paper is structured as follows. Section II formally defines innovation and elaborates on its various sources and distinct skill sets. Section III introduces the important concept of entrepreneurial design and describes some of the most promising innovation techniques for effectively achieving product/market fit. In Section IV, we provide an outlook on the future expectations of science for achieving an increased societal impact before drawing final conclusions in Section V.

II. INNOVATION: WHAT IS IT AND WHAT ARE ITS SOURCES?

Although some countries may have extensive natural resources to get rich by exporting them, for most of the other countries innovation is the only viable way to make societies wealthier by raising the standard of living available to their people. Traditionally, one may think of innovation as a series of discrete inventions followed by incremental improvements, which ultimately tap the full potential of the initial invention. However, there exists a subtle difference between invention and innovation. According to the pre-eminent innovation scholar Joseph Alois Schumpeter, innovation may be defined as follows:

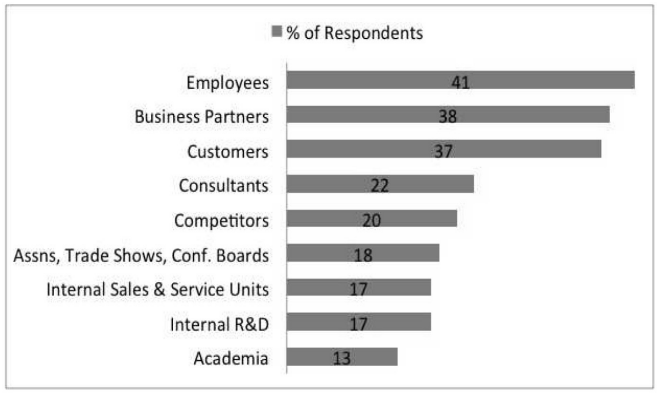

Figure 1. Sources of new ideas and innovation [4].

"Innovation is the market introduction of a technical or organizational novelty, not just its invention." (Joseph Alois Schumpeter, 1883-1950)

Clearly, this widely recognized definition of innovation reinforces Clifton's aforementioned comment on the importance of translating ideas into actual businesses. In fact, innovation is the essence of high technology and business and though the content changes over the years, the underlying process of innovation doesn't, as observed by serial entrepreneur Andreas von Bechtolsheim. In his Stanford Engineering Hero Lecture [4], Bechtolsheim elaborated on the question where innovative ideas actually come from and concluded that the most likely place for innovation are the employees of a company, as shown in Figure 1, followed by business partners and customers as useful inspirations for innovation to solve their particular problems. Conversely, the internal R&D department of companies ranks low, and so does academia because generally there is not as much connection between companies and academia as there should be.

Despite these tendencies at the organizational level, it is important to note that at the individual level creative ideas can come from anywhere by leveraging certain innovation skills, as described in more detail in the following two subsections.

The Five "Discovery Skills"

In their extensive study of the innovator's DNA [5], the

[1] Gerry Shih, "Peter Thiel, university-hater, heads to campus," Reuters Small Business, March 12, 2012.

authors identified the following five "discovery skills" that distinguish innovative entrepreneurs:

- *Associating*: Associating is a central innovation skill that denotes the ability to successfully connect seemingly unrelated questions, problems, or ideas from different fields that can be recombined in new ways.
- *Questioning*: The most important innovation skill is to constantly ask provocative questions that challenge common wisdom and assumptions underlying *the status quo*. Finding the right question by imagining the synthesis of opposing ideas and imposing or eliminating constraints on our thinking to see a problem or opportunity from a different angle is more important than finding the right response.
- *Observing*: By observing others and scrutinizing common phenomena and behavior of potential customers, innovators act like anthropologists and social scientists.
- *Experimenting*: Experimentation to test hypotheses and provoke interactive experiences is critical to gain important insights in the search for and development of new products or processes.
- *Networking*: Finding and testing ideas through a network of diverse individuals gives innovators a radically different perspective.

The Seven "Survival Skills"

According to [6], in an increasingly flat world all students graduating from academia now need to master the following seven survivability skills:

1) Critical thinking and problem solving
2) Collaboration across networks and leading by influence
3) Agility and adaptability
4) Initiative and entrepreneurship
5) Accessing and analyzing information
6) Effective oral and written communication
7) Curiosity and imagination.

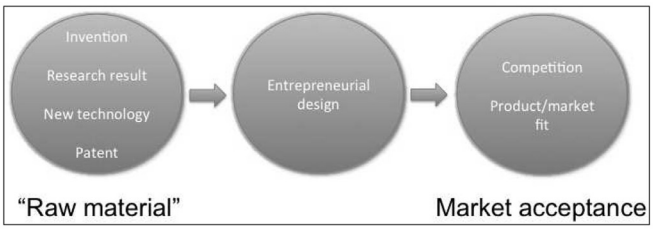

Figure 2. Entrepreneurial design: The missing link between the "raw material" of invention, research result, new technology, or patent and its market acceptance.

The author of [6] notes that these skills, while absolutely necessary, are not sufficient for the development of young people's capabilities to innovate. In a more innovation-driven economy, students need to have in addition some essential qualities such as perseverance, a willingness to experiment, take calculated risks, tolerate failure, and the capacity for "design thinking," the well-known human-centered, design-based approach for interdisciplinary collaboration pioneered by the d.school at Stanford University. Importantly, he concludes that there remains one blind spot in most of today's innovators—the lack of a clear understanding of how their innovations can be converted into value that sustains their enterprises, their communities, and themselves and learning how new wealth is created.

The process to transform an invention, research result, new technology, or patent, which together may be better viewed as "raw material," into its market acceptance, as illustrated in Figure 2, is known as the entrepreneurial design. In the following section, we further elaborate on the concept of entrepreneurial design and present several innovation techniques for effectively achieving product/market fit.

III. ENTREPRENEURIAL DESIGN

Today there is no shortage of ideas, resulting in a large number of inventions and patents. However, more often than not serious problems arise when it comes to their practical realization, leaving most inventions and patents stranded.[2] This is due to the fact that research and market follow very different rules. *Key to the successful market introduction is not the quality of an invention but its acceptance by consumers.* The entrepreneurial design is the missing link between a rough first idea and its eventual market acceptance.

A. Concept-creative Entrepreneurship

According to [7], the development of an innovative entrepreneurial concept of ideas is a creative process, leading to a new type of concept-creative entrepreneurship that doesn't necessarily require any invention, patent, or research results in the first place. Today's bottleneck is not production, business know-how, or capital, but the fact that creative concepts are particularly rare. The choice of the right entrepreneurial design requires a feel for societal changes, future game changers, and market developments. Today's bottleneck is not supply but demand, where consumers have a greater impact on the market than producers. The question is not what but rather why something should be produced.

At the heart of entrepreneurial design lies the understanding of the psychology of markets, assessing their shifts, coping with technological progress, and designing a concept that turns out to be sustainable in an uncertain environment. The concept should be in line with the entrepreneur's own mindset, talents, desires, and passion. Its innovative potential can be realized in what previously exists by rearranging resources from multiple perspectives with different angles, while keeping in mind that function trumps convention in a continuous search for simplicity or reduced complexity. A sophisticated concept of ideas coupled with its realization by combining readily

[2] For instance, in the mid-2000s, only 197 patents out of 27,322 held by U.S. universities made more than $1 million in earnings.

available components is the recipe of commercial success, or in brief, it's concept plus components. Thus, the practical implementation of a developed entrepreneurial concept can be reduced to the combination or recombination of components, *e.g*., Amazon Elastic Compute Cloud (EC2) web service, as discussed in more detail next.

Combinatorial Innovation

Google's chief economist Hal Varian argues that we're currently again in the middle of a period of combinatorial innovation, where innovators could combine or recombine different component parts to create new inventions and more valuable systems.[3] Historically, in the 1800s, it was interchangeable parts. In the 1920s, it was electronics. In the 1970s, it was circuits. And now, according to Varian, what we see is a period where you have Internet components that are all bits, which never run out and can be reproduced, duplicated, and spread around the world without shortage and inventory delays. In fact, information and communications technologies (ICTs) have given birth to radically new ways to combine and recombine ideas, whereby the Internet fosters recombinant innovation by enabling us to mix and remix ideas, both old and recent, in ways we never could before [3].

Innovation Techniques

In the following, we highlight some of the most promising and effective techniques that may be applied separately or jointly to combinatorial innovation for the sake of achieving product/market fit.

- Zero to One: Blue Ocean Strategy

In his critically acclaimed book "Zero to One" [8], Peter Thiel's primary goal was to help students see beyond the tracks laid down by academic specialties to see the broader future that is theirs to create. According to Thiel, the future of progress can take one of two forms. Horizontal progress means copying things that work, *i.e*., going from 1 to n. The single word for horizontal progress is globalization, taking things that work somewhere and making them work everywhere. Conversely, vertical progress means doing new things, *i.e.*, going from 0 to 1. Vertical progress is harder to imagine because it requires doing something nobody else has ever done. The single word for vertical progress is technology, which he generically defines as any new and better way of doing things. Because globalization and technology are different modes of progress, it's possible to have both, either, or neither at the same time. However, technology matters more than globalization. According to Thiel, technology— properly understood—is the one way for us to escape competition in a globalizing world. Or as he rephrased it in a somewhat more provocative tone in a recent article[4] in the *Wall Street Journal:* "Competition is for losers."

In [9], W. Chan Kim and Rene´e Mauborgne elaborate in more detail on how to create uncontested market space and make the competition irrelevant by applying their so-called blue ocean strategy. The market space may be viewed as consisting of two sorts of oceans: red oceans and blue oceans. Red oceans represent all the companies in existence today that try to outperform their rivals to grab a greater share of existing demand, resulting in an increasingly crowded market space with reduced prospects for profits and growth. To seize new profit and growth opportunities, companies need to go beyond cut-throat competition by creating blue oceans, which denote all the industries not in existence today. Compared with red ocean strategy, blue ocean strategy represents a significant departure from the *status quo*. The focus of strategy work over the past thirty years has been on competition-based red ocean strategies, providing us with a fairly good understanding of how to compete skillfully in red waters. Conversely, in blue oceans, competition is irrelevant because the rules of the game are waiting to be set.

The cornerstone of blue ocean strategy is value innovation. Value innovation places equal emphasis on value and innovation. Value (to be defined more formally shortly) without innovation tends to focus on value creation on an incremental scale. Innovation without value tends to be technology-driven, market pioneering, or futuristic, often shooting beyond what buyers are ready to accept and pay for. Hence, it is important to distinguish between value innovation as opposed to technology innovation and market pioneering. If companies fail to anchor innovation with value, technology innovators and market pioneers often lay the eggs that other companies hatch. Value innovation is a new way of thinking about and executing strategy that results in the creation of a blue ocean and a break from competition.

Unfortunately, blue oceans represent unknown market space and are largely unchartered. However, there exist a number of techniques to formulate and execute blue ocean strategy such as the so-called strategy canvas, which Samsung Electronics has institutionalized in the key business creation decisions of its Value Innovation Program (VIP) Center in the aftermath of the 1997 Asian financial crisis in order to break out of commodity-type competition. The strategy canvas is central to value innovation and is both a diagnostic and an action framework for building a compelling blue ocean strategy. Reading the strategy canvas properly enables companies to see the future in the present. As illustrated in Figure 3, the strategy

[3] McKinsey&Company, "Hal Varian on How the Web challenges managers," Jan. 2009.
[4] Peter Thiel, "Competition Is for Losers," *The Wall Street Journal,* Sept. 12, 2014.

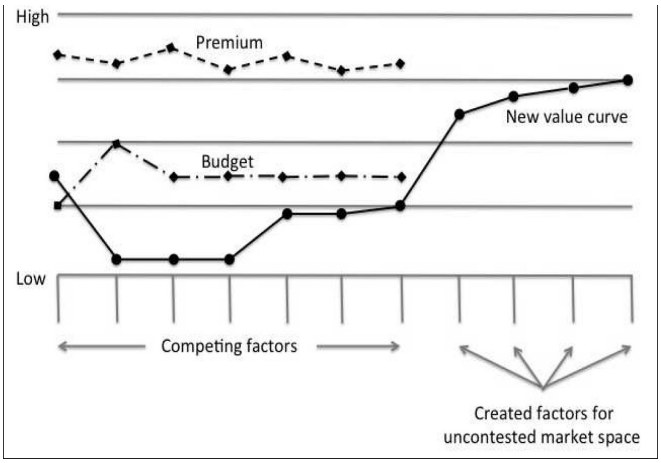

Figure 3. Blue ocean strategy: The strategy canvas [9].

canvas is a visualizing tool that helps focus on the big picture and develop a strategy that breaks away from the competition. It allows you to understand where the competition is currently investing and the range of factors the industry currently competes on in premium and budget products, services, and delivery, as depicted on the horizontal axis. The vertical axis of the strategy canvas captures the offering level that buyers receive across competing factors. The basic component of the strategy canvas is the value curve, which is a graphic depiction of a company's relative performance across its industry's factors of competition. To fundamentally shift the strategy canvas of an industry, you must reorient your strategic focus from competitors to alternatives and from customers to noncustomers of the industry, thereby redefining the problem the industry focuses on and reconstructing buyer value elements that reside across industry boundaries, resulting in a new value curve across competing and created factors for uncontested market space, as shown in Figure 3. Towards this end, Figure 4 depicts the so-called four actions framework that breaks the trade-off between differentiation

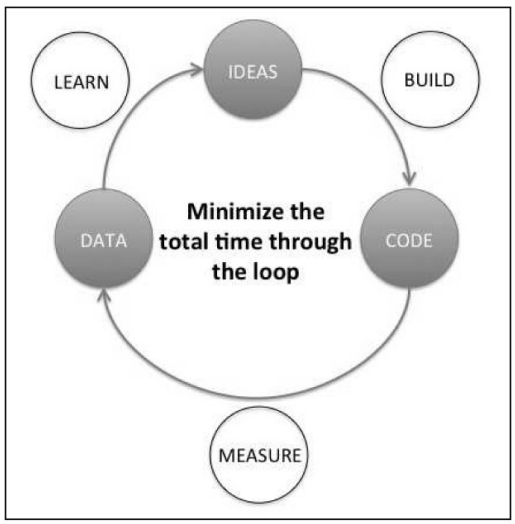

Figure 4. Blue ocean strategy: The four actions framework [9].

and low cost by addressing four key questions to challenge an industry's strategic logic and business model and thus craft a new value curve.

The aforementioned strategy canvas and four actions framework are the two basic analytics underlying blue oceans. For further information about blue ocean strategy, the interested reader is referred to [9].

The Lean Startup: Continuous Innovation via Build-Measure-Learn Feedback Loop and Minimum Viable Product Development

During the process of putting new strategies into practice a tremendous amount of resources may be wasted in startup companies that typically operate under conditions of extreme uncertainty. The problem with most entrepreneurs' plans is generally not that they don't follow sound strategic principles but that the facts upon which they are based, *i.e.*, underlying assumptions and hypotheses, are wrong. To find ways to help startups learn which elements of their strategy are working and avoid the risk of developing products and services nobody

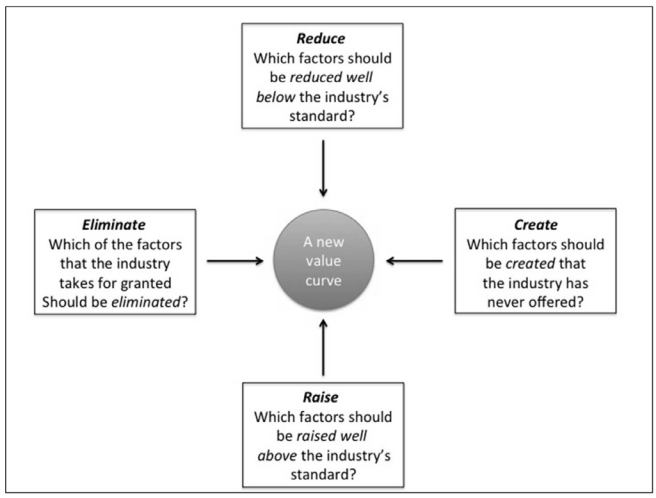

Figure 5. Continuous innovation: The build-measure-learn feedback loop [10].

wants, Eric Ries applied 'lean thinking' to the process of continuous innovation that emphasizes fast iteration and customer insight [10]. According to Ries, the big question in the twenty-first century is not "Can it be built?" but "Should it be built?" Startups exist to learn to build a sustainable business by running frequent experiments that allow entrepreneurs to test each element of their vision. Specifically, the fundamental activity of a startup is to turn ideas into products/services, measure how customers respond, and then learn whether to pivot or persevere. All successful startup processes should be geared to accelerate this build-measure-learn feedback loop in order figure out the right thing to build as quickly as possible, as illustrated in Fig. 5.

The concept of the so-called minimum viable product (MVP) helps entrepreneurs start the process of validated learning as quickly as possible. The MVP is the fastest way to get through the build-measure-learn feedback loop with the minimum amount of effort. The goal of the MVP is to begin the process of learning, not end it. Instead of building a prototype or concept test, an MVP is designed not just to answer product design or technical questions, but more importantly to test fundamental business hypotheses by observing real customers' demand, unexpected behavior, and their actual needs. A well-known example of MVP is Dropbox's three-minute video and beta waiting list to validate that customers wanted the product prior to start developing it (and not the other way around).

- The Pro-Am Revolution: An Era of Open Innovation

CEOs understand the importance of innovation to growth. However, mature companies realized that they couldn't meet their growth objectives by spending more and more on R&D for less and less payoff due to the explosion of new technologies putting ever more pressure on their innovation budgets. For instance, by 2000, it was clear to Procter & Gamble (P&G) that the conventional invent-it-ourselves model was not capable of sustaining high levels of top-line growth. To accelerate products from concept to launch at a fraction of the costs, P&G reinvented its innovation business model and created the so-called connect and develop (C&D) innovation model, *i.e.,* moving from R&D to C&D.[5] C&D is about finding good ideas and capturing a certain amount of innovation externally.

To focus the idea search, C&D starts with consumer needs lists, which are then developed into science problems to be solved. The problems are often spelled out in technology briefs, which are sent to a network of possible solution providers worldwide, leveraging on P&G's observation that important innovation was increasingly being done at small and midsize entrepreneurial companies or individuals. For example, for the development of Pringles Prints, P&G simply circulated a technology brief throughout their global networks of individuals and institutions to discover if anyone in the world had a ready-made solution. It was through their European network that they discovered a small bakery in Bologna, Italy, run by a university professor who also manufactured the appropriate baking equipment. Key to the success of this radical idea was to move P&G's attitude from resistance to innovations "not invented here" to enthusiasm for those "proudly found elsewhere."

In [11], the role of enthusiasts in changing our economy and society was further investigated across various sectors. The authors argue that the 20th century was shaped by the rise of professionals. But now a new breed of amateurs has emerged, who pursue amateur activities to professional standards, giving rise to the so-called Pro-Am revolution that reverses the historic shift and rethinks the categories of professional or amateur. According to [11], Pro- Ams play three distinct roles in innovation: (i) They can be disruptive innovators, (ii) lead innovation in use, and (iii) are vital to service innovation. In fact, Pro-Am communities may become the new R&D labs of the digital economy, where lead users should play a larger role in foresight exercises to chart the future course of innovation. MIT professor Eric von Hippel, the recipient of the EU Innovation Luminary Award 2015, came to a similar conclusion in his seminal book on *"Democratizing Innovation."* He argues that there has been a general trend and welfare-enhancing shift toward a widely distributed open user innovation process driven by steadily better and cheaper computing and communications, whereby users tend to develop innovations that deliver novel functions while manufacturers rather develop convenience or reliability improvements.

To unleash the full potential of Pro-Ams, it will be important to foster interactions between user and producer innovation paradigms and leverage the co-creation of value between producers and consumers, who have more freedom to experiment and innovate in embryonic markets. This insight is now starting to materialize in strategic collaborative innovation partnerships between a young, entrepreneurial firm and an established firm [12]. As Mark Esposito from Harvard University Extension School observed, today's businesses of all sizes risk becoming irrelevant on a daily basis due to rapid technological change and the speed of communication permanently altering the rate at which markets evolve. Collaborative innovation combines the strengths of young and established firms and allows for compensation of each company's weak points. Specifically, collaborative innovation helps address one of the greatest obstacles for entrepreneurs: scaling up. On the other hand, collaborative innovation brings back to established firms creative entrepreneurialism that is hard to preserve under multiple layers of management.[6]

In future, a new type of collaborative innovation is needed in many different industries and walks of life to allow us to face the immense, combined challenges of the next few decades. Among others, meeting the explosion of demand from billions of aspirational new consumers in the developing world and providing a new model of growth for the majority of low- and middle-income families in the developed world who have seen their living standards stagnate.

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[5] L. Huston and N. Sakkab, "Connect and Develop: Inside Procter & Gamble's New Model for Innovation," *Harvard Business Review*, March 2006.

[6] M. Esposito, "The 5 rules of collaborative innovation," World Economic Forum, Aug. 2015.

Frugal innovation is a new wave of innovation that is spreading around the world, which provides better solutions for more people by using fewer resources by doing things completely differently following the design motto: "Less, but better" [13].

IV. GRAND SOCIETAL CHALLENGES

With regard to the future expectations of science, the concept of Grand Societal Challenges is becoming increasingly important. The importance of research and innovation will not be reduced by adding the tackling of Grand Societal Challenges as a new goal. A recent position paper of the German Council of Science and Humanities formulates several important consideration to supplement research and innovation by including not only technological, but also social innovations [14]. Social innovations aim at creating a better quality of life for every individual by involving society as a central stakeholder and giving greater importance to the participation of lay persons. The tackling of Grand Societal Challenges aims at achieving comprehensive societal transformations that are predicated on the creation of awareness and, in certain cases, changes in values. Although there exists no explicit definition of what is meant by Grand Societal Challenges, they are commonly characterized by a large societal impact and high levels of complexity and interdependency. Furthermore, they cannot be confined regionally, nationally, or geographically. Current examples of Grand Societal Challenges include but are not limited to climate change, energy supply, water resources, ageing societies, and well-being.

With their global and transnational context, the development and supporting of social innovations that are based on a more comprehensive understanding of the common good are also important in addition to the market introduction of product and process innovations. The contributions of science should not be limited to the development and investigation of new technologies, production processes, and products. Instead, heterogeneous bodies of scientific and practical knowledge from various disciplines must be bundled and recombined in a flexible manner in order to identify and cope with Grand Societal Challenges, giving way to transdisciplinary forms of cooperation that define problems in a long-term, cross-disciplinary manner and solve them independently of disciplinary boundaries. As a consequence, the merging of specific technologies, processes, methods, and instruments may lead to the creation of a new research field.

According to [14], orientation based on Grand Societal Challenges can have an impact on the internal organization of universities and non-university research institutions, on the structure of courses of study, and on career paths in science. Grand Societal Challenges imply that many people change their way of living by using new technologies and other approaches. Instruments that allow those affected to participate in the development of solution approaches can deliver results that are easier to implement and improve people's willingness to change their behaviour. This can be best accomplished if a variety of autonomous institutions work on the analysis of Grand Societal Challenges and the development of specific strategies in a decentralized (*i.e.,* bottom-up rather than top-down) manner.

V. CONCLUSION

Innovation has been recognized by economists as the outstanding fact in the economic history of capitalist society and the only viable way to make our society wealthier by raising the standard of living available to its people. In his book on mass flourishing, Edmund Phelps, the 2006 Nobel Laureate in Economics, explains how prosperity was gained in the 19th century and how it was lost in the 20th century. He calls to rehabilitate modern capitalism by clearing away blocks to indigenous innovation down to the grassroots, which in the past permeated nations from the bottom up with income going equiproportionately to the less advantaged and an inbuilt tendency toward social inclusion due to economic dynamism [15]. Indeed, in her recent book Makers and Takers, Rana Foroohar shows that since the 1980s the rise in money spent on share buybacks and the fall in corporate spending on productive investments like R&D make a perfect X, with S&P 500 firms now spending $1 trillion a year on buybacks and dividends—equal to about 95% of their net earnings—rather than investing that money back into research, product development or anything that could contribute to long-term company growth [16]. No sector has been immune, not even the ones we think of as the most innovative. Little wonder, then, that business creation is lower than it was 30 years ago, or that wages are flat and inequality growing.

This paper provided a tutorial of a wide variety of innovation skills, techniques, and strategies that academics can apply to create more "PhD-entrepreneurs" in order to close the gap between stranded academic research results, inventions, patents and market acceptance. On the other hand, established companies operate under intense pressure of short-term profitability seeking as opposed to academia, whose freedom should be much more exploited for long-term (re)thinking on both technological and social challenges independently of the industry's current trends and hypes. Or as the CTO of a global leader of ICT solutions recently advised the academic author of this paper: "Stop following us!"

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