



Contents lists available at ScienceDirect

Research Policy

journal homepage: [www.elsevier.com/locate/respol](http://www.elsevier.com/locate/respol)

# Mobilizing innovation for sustainability transitions: A comment on transformative innovation policy

Jan Fagerberg<sup>1</sup>

Centre for Technology, Innovation and Culture, University of Oslo, Norway

## ARTICLE INFO

### Keywords:

Transformative innovation policy  
Mission-oriented policy  
Innovation system  
Climate change  
Sustainability  
Transition

## ABSTRACT

The topics addressed in this paper concern the (much-needed) transition to sustainability and what role (innovation) policy can play in speeding up such changes. In their Discussion Paper Schot and Steinmueller (2018) argue that the existing theorizing and knowledge bases within the field of innovation studies are “unfit” for this task and that a totally new approach is required. This paper takes issue with this claim. Policy advice, it is argued, needs to be anchored in the accumulated research on the issue at hand, in this case, innovation. The paper therefore starts by distilling some important insights on innovation from the accumulated research on this topic and, with this in mind, considers various policy approaches that have been suggested for influencing innovation and sustainability transitions. Finally, the lessons for the development and implementation of transformative innovation policy are considered. It is concluded that the existing theorizing and knowledge base in innovation studies may be of great relevance when designing policies for dealing with climate change and sustainability transitions.

## 1. Introduction

Economic growth has improved living standards, health and longevity across the globe, although the benefits have been far from evenly distributed. But it has also led to increasing pressure on scarce resources and ecosystems, and continuing on the same track for ever would definitely not be sustainable.<sup>2</sup> In particular, the burning of fossil fuels to provide energy has (in addition to local pollution) led to growing emissions of greenhouse gases into the atmosphere and steady increases in the global temperature, with potentially very negative environmental and economic consequences in the years ahead (Stern, 2015). To avoid this outcome, emissions of greenhouse gases need to be reduced to almost zero before the end of this century, a goal that almost all nations now have agreed to.<sup>3</sup> This is a very demanding goal indeed, as 80% percent of global energy is provided through burning of fossil fuels.<sup>4</sup> To reach this goal, extensive changes in technology, economic structure, governance, and ways of life will be required. That is why innovation – and policies supporting it – is essential for the transition to

sustainability (Fagerberg et al., 2016).

While it is easy to argue that innovation must play an important role in the transition towards sustainability, it is much more challenging to provide good models for how policy may help in mobilizing innovation for this purpose (Mowery et al., 2010). Nevertheless, there is a growing literature using insights from innovation studies and, to a varying degree, other scientific fields to discuss how innovation policy can make a difference in this respect, employing concepts such as eco-innovation policy (Kemp, 2011), transformative innovation policy (Steward, 2012) or mission-oriented innovation policy (Mazzucato, 2017). Schot and Steinmueller (2018) argue that the existing theorizing and knowledge base within the field of innovation studies is “unfit” for this task and that a totally new approach (or knowledge base) is required. However, Schot and Steinmueller’s disdain of the existing knowledge base on innovation arguably results in rather vague policy advice. For example, the role of firms in transformative innovation is hardly discussed, although it should be well known that the private business sector is the major source of innovation in contemporary societies, and that without

E-mail address: [jan.fagerberg@tik.uio.no](mailto:jan.fagerberg@tik.uio.no).

<sup>1</sup> <http://www.janfagerberg.org/>.

<sup>2</sup> Sustainability can be defined very broadly, as in the seventeen sustainable development goals (SDG) agreed to by the United Nations (<http://www.un.org/sustainabledevelopment/sustainable-development-goals/>), or more narrowly as the ability of the economy to “function within the capacity provided by the earth’s ecosystems” (Dietz and O’Neill 2013, p. 46). However, the latter is obviously of vital importance for the former.

<sup>3</sup> The Paris climate agreement (or convention) was adopted by consensus between 196 parties at the 21st Conference of the United Nations Framework Convention on Climate Change (UNFCCC) in Paris on 12 December 2015. As of December 2017 171 parties have ratified the convention (<http://unfccc.int/2860.php>).

<sup>4</sup> See <https://data.worldbank.org/indicator/EG.USE.COMM.FO.ZS>, accessed on November 30, 2017.

<https://doi.org/10.1016/j.respol.2018.08.012>

Received 29 January 2018; Received in revised form 25 June 2018; Accepted 18 July 2018

0048-7333/ © 2018 Elsevier B.V. All rights reserved.

their active participation pleas for transformative innovation, although well-intended, have little chance of succeeding. Arguably, this is an issue for which the received knowledge-base within innovation studies may be very relevant.

Before going into the subject matter of this paper in more detail a few clarifications may be in order. First, as is common in innovation studies (Fagerberg, 2004), this paper uses the term innovation in a broad sense, i.e., including the entire process from the creation of new ideas to their implementation and diffusion in the economic and social system. This is particularly important in the context of sustainability transitions, for which changes in practice, i.e., implementation and diffusion, are essential (Mowery et al., 2010). Second, this paper identifies innovation policy with policies (and policy instruments) that influence innovation in a non-trivial manner (Edquist, 2004), since what matters for achieving real progress with respect to the transition to sustainability is a policy's impact, not its label. This means that a range of sectoral policies which are important for innovation (and sustainability transitions) but that are (mainly) carried out for other purposes become very relevant (Fagerberg, 2017). It also raises important questions with respect to governance, coordination and direction of policy, which (as we shall see) have been central to innovation policy discussions for some time, but that arguably become of even greater relevance for the ability to carry out the more ambitious transformative policies that contemporary challenges require. Third, it is important to distinguish between innovation policy practice, on the one hand, and theories – or frames – used to understand, develop and justify it (which is the main focus of Schot and Steinmueller, 2018), on the other hand. In fact, the term innovation policy is fairly recent, dating back to around 1980 (Rothwell, 1982), and the same goes for dedicated theorizing about it (see Fagerberg, 2017). However, innovation policy practice (as defined in this paper) has a much longer history, although as Boekholt (2010) explains, earlier on such policies were usually motivated by other aims and carried other labels (e.g., science, defence, health, industrial policy). Kemp (2011) similarly classifies innovation policies during this period as “mission-led support for military technologies and civil engineering technologies” (Kemp, 2011, p.2). A relevant question, which will be considered in the next section, is to what extent there are important lessons from these early experiments with mission-oriented policy for how to deal the complex grand challenges facing policy makers today (see e.g., Mazzucato, 2013).

The paper starts, in the next section, by distilling some important insights on innovation from the accumulated research on this topic<sup>5</sup> and, with this in mind, considers various policy approaches that have been suggested for how to mobilize innovation in the pursuit of broader societal goals (such as sustainability transitions). The final section sums up the lessons for the development and implementation of transformative innovation policy.

## 2. Innovation, sustainability transitions and policy

Innovation was for a long time a neglected topic in mainstream social science. The main exception to this rule was the Austrian-American economist Joseph Schumpeter, who already a hundred years ago developed an original theory of innovation as the driving force of long run economic and societal change.<sup>6</sup> The main focus was, just as in some of the more recent work on sustainability (e.g., Daly, 2008), not

<sup>5</sup> For broader overviews of the knowledge-base on innovation see Fagerberg et al. (2004); Hall and Rosenberg (2010) and Fagerberg et al. (2012).

<sup>6</sup> Schumpeter's main works were “The Theory of Economic Development”, published in German in 1912 and in a revised English edition in 1934, and “Capitalism, Socialism and Democracy” from 1942 (). For a brief introduction to Schumpeterian theory and its subsequent application by others see Fagerberg (2003).

on economic growth per se but on qualitative changes in the composition of output, the organization of economic activities, and the structure of the economy. Schumpeter made a sharp distinction between invention, i.e., new ideas for how to do things, and innovation, that is, the ability to carry these out in practice, because:

“As long as they are not carried out into practice, inventions are economically irrelevant. And to carry any improvement into effect is a task entirely different from the inventing of it, and a task, moreover, requiring entirely different kinds of aptitudes.” (Schumpeter, 1934, p. 88).

According to Schumpeter innovation comes in many different shapes, e.g., not only technological but also organizational, and different sizes, ranging from very radical innovations, such as railways, electricity or use of fossil fuels as a power source, that might totally revolutionize the society and the economy, to minor changes in existing products and processes. He also provided us with a theory of innovation as “new combinations”. Hence, what is new is not necessarily the constituent parts but the way they are put together. Thus, contemporary innovation is influenced by innovation in the past, just as today's innovation activities contribute to shape future innovation paths.<sup>7</sup> In this combinatory dynamics, the innovative firm draws on various resources such as knowledge, skills, and finance, and its possibility to succeed critically depends on being able to mobilize these resources. The innovative firm also depends on the institutional framework into which it is embedded, and - not the least - on whether there is a market for its innovations: Innovations that are not sufficiently appreciated by potential customers, that is, are selected against, are doomed to failure. Moreover, these various factors generally are complements rather than substitutes.

There are important lessons from this, not only for firms (that tend to learn this the hard way), but also for policy-makers that wish to encourage innovation. That is, to succeed with innovation support it is not sufficient to focus one particular resource, say knowledge, because there may be other constraints that are equally or more relevant. Thus, a holistic perspective on innovation, focusing not only on supply but also demand factors, is essential for success in innovation policy (Boekholt, 2010; Edquist, 2004; Edler and Georghiou, 2007; Edler and Fagerberg, 2017; Kemp, 2011).

### 2.1. Supporting radical innovation

One of the most salient features of radical innovation is that it takes time, often several decades if not more. As Nathan Rosenberg and Stephen Kline explain:

“... most important innovations go through drastic changes in their lifetimes – changes that may, and often do, totally transform their economic significance. The subsequent improvements in an invention after its first introduction may be vastly more important, economically, than the initial availability of the invention in its original form” (Kline and Rosenberg 1986, p.283).

Hence, as they point out, the first versions of an innovation are often unpractical, costly devices that have problems in reaching out to customers in large numbers. History is replete with examples, e.g., when the first cars appeared towards the end of the 1800s they were generally regarded as expensive (and unreliable) toys for the rich. Moreover, the first computers, appearing about half a century later, were extremely large, expensive and with little computing power compared to, say, a present-day smart phone, and therefore with very limited market appeal except for the US military and a few other customers. Similarly,

<sup>7</sup> This may give rise to innovation paths or trajectories influencing innovation activity and economic development for considerable periods of time (Dosi, 1982; Freeman et al., 1982; Freeman and Louçã, 2001).

Download English Version:

<https://daneshyari.com/en/article/10226816>

Download Persian Version:

<https://daneshyari.com/article/10226816>

[Daneshyari.com](https://daneshyari.com)