

# A Conceptual Framework for Responsible Innovation

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## **Abstract**

This paper proposes a framework to assist firms in achieving sustainable and responsible innovation in their research and innovation processes. It unravels how Japanese firms (such as Shiseido, Toyota, Rakuten etc.) have successfully taken into account of effects and potential impacts on the environment and society when accelerating their product innovation and services. For example, Nintendo Inc., a world leading Japanese consumer electronics and video game company, is one of the most influential in the industry for its reputation in corporate social responsibility (CSR) and rapid innovation. The ability of Japanese firms to launch new products in rapid succession over short periods of time is worth worldwide attention, as this could inform the next generation of innovation. In this paper, we discuss the framework that sets out the cornerstones for responsible product innovation.

## **Keywords**

Accelerated Innovation, Creativity, Responsible, Low Cost, Corporate Social Responsibility

## **(1) Introduction**

The term Responsible Innovation (RI) or 'Responsible Research and Innovation' is an emerging language for science and society, especially in the UK, Europe and in the USA. The most widely cited definition of RI is of Rene von Schomberg (2011), who defines RI as 'Responsible Research and Innovation is a transparent, interactive process by which societal actors and innovators become mutually responsive to each other with a view to the (ethical) acceptability, sustainability and societal desirability of the innovation process

and its marketable products (in order to allow a proper embedding of scientific and technological advances in our society)'. In a nutshell, the idea of responsible innovation is to engage public participation early into the research and product development process and embed the process with a sound scientific and technological risk assessment approach (Stilgoe et al, 2013). So far, RI stirs great expectations, hence requires tighter scrutiny (Nerlich & McLeod, 2016). Practitioners and academics need an easy to interpret framework to better understand and interpret RI in practice.

Nonetheless, the concept of RI is not entirely novel. Eco-innovation has been widely implemented in Japan in 80s. Japanese products, with strong synthesis of aesthetic, harmony and function is well suited to maintaining humanity, environmental friendly and connection in a technology driven world (Yamada, 2008). For example, Nintendo Inc., a world leading Japanese consumer electronics and video game company, is one of the most influential in the industry for its reputation in corporate social responsibility (CSR) and rapid innovation (Nintendo, 2018). The ability of Japanese firms to launch new products in rapid succession over short periods of time is worth worldwide attention, as this could inform the next generation of innovation, especially RI.

This paper aims to unravel how Japanese firms have successfully takes into account of effects and potential impacts on the environment and society when accelerating their product innovation. Drawing on literature as well as best practices from various firms, in this paper, we propose a framework that sets out the cornerstones for responsible product innovation.

## **(2) Towards a Conceptual Framework for Responsible Innovation**

There is no shortage of terms for innovation i.e. incremental innovation (Proctor et al., 2004), disruptive innovation (Tan & Perrons, 2009), radical innovation, open innovation (Tan et al. 2015), serial innovation (Chung and Tan, 2017), transformative innovation (Li and Tan, 2017), and accelerated innovation (Tan & Zhan, 2016). In the OECD Oslo Manual (2005), innovation is categorised into four types i.e. product innovation, process innovation, organisational innovation, and marketing innovation. Based on a long-term study of innovation and creativity management

in Japan, Xu and Nash (2013) argue that innovation can be structured into four dimensions i.e. product innovation, process innovation, business innovation, and social innovation. The four dimensions proposed by Xu and Nash (2013) are overlapped with the OECD Oslo manual. Especially, the organisational and marketing innovation dimension of the OECD (2005) is grouped under the business innovation dimension in the Xu and Nash's work.

In sustainable term, all innovations may be categorised into eco-innovation, green innovation or responsible innovation. In this section, we adapt Xu and Nash (2013) four innovation structure as the theoretical arguments that underpin our framework on responsible innovation. We do acknowledge stakeholders (i.e. governments, NGOs, community actors, employees) play a significant role in responsible innovation because frequent meaningful interactions between firms and stakeholders can influence the economic, environmental, and social activities. We then linking the proposed framework with the responsible innovation concept. We use examples and good practices of existing Japanese firms to discuss how the framework may add to the current discourse and management on responsible innovation.

### **1. Product Innovation**

Product innovation is not just about improvement of functions, quality or esthetics. Product innovation should also take into account factors from various levels ranging from social ecology, society, to individual. A good example is Shiseido, one of the leading hair care firms in Japan. The firm produces many well-known products that make people happy through beauty (Shiseido, 2018). Shiseido also supports women empowerment in its business operations and respects diverse beauty. Though most

products are ‘designed’ in Japan, the firm strongly promote ethical supply chain and recycling of resources (see Table 1). The whole process from sourcing, manufacturing, logistics, selling, and recycling is well thought out for each and every product in Shiseido.

**Table 1: Product Innovation**

Product innovation	Social ecology	Society	Individual
Shiseido	Ethical supply chain, resources recycling	Women empowerment, respect diverse beauty	Makes people happy through beauty

**2. Process Innovation**

A process innovation normally involve new production or methods. Toyota is a world famous process innovation firm. Toyota Production System aka Lean Manufacturing is being actively adopted by governments, universities, NGOs, and firms worldwide to improve their product or service operations. Through process innovation, Toyota enables cars to be manufactured in high quality, exceeding safety requirements, yet at an affordable price for consumers (Toyota, 2018). The 7 waste concept also helps to educate managers to take a wider view on their operations from sourcing of raw materials to product end of life recycling potential (see Table 2). Toyota production system respect individual worker and pursuing sustainable operations in very processes. For example, the *karakuri* is an automated mechanism to reduce workers’ stress and labour. The approach is suitable for most assembly operations and it relies on gravity and simple mechanism, hence eliminates energy consumption in production.

**Table 2: Process Innovation**

Process innovation	Social ecology	Society	Individual
Toyota	Recycling based society and systems	Initiatives for traffic safety	Respect for individual

**3. Business Innovation**

At the corporate strategy level, business innovation aims to create value for firms. It typically involves a business model to offer (or bundle) existing products or services to customers but at a higher value. Especially with the advent of internet and technology, many firms are able to ‘disrupt’ incumbent players through business innovation. A new business model can open up novel ways to generate revenue as well as adding values to consumers through integrating services, new solutions, and unique customer experiences. For example, using e-commerce, Rakuten allows consumers to shop from home, a service offering that provides much convenient to millions of shoppers. All purchases through Rakuten are protected and sometime shoppers may enjoy more ‘perks’ (i.e. extended guarantee, longer refund date etc.) than buying from a physical store (see Table 3).

**Table 3: Business Innovation**

Business innovation	Social ecology	Society	Individual
Rakuten	Social entrepreneur program	Latest technology to address local issues	Individual purchase protection

By using latest technology, Rakuten also initiated projects with communities to address

local issues (Rakuten, 2018). With its specific knowledge and vast IT resources, Rakuten works with local entrepreneurs to grow their businesses and help to promote social harmony.

**4. Social Innovation**

As the name implying, social innovation involves changes (new technology or business schemes) that have an impact on society. A good example of social innovation is by Nintendo, one of the world’s largest video game companies. Its mission is not just fun and entertainment for everyone, but also “Bringing Smiles to Future Generations” (Nintendo, 2018). To ensure that products are safe for everyone, especially young children, Nintendo has established its own design safety standards for product development. Game ratings systems enable individual to select games that are suitable and acceptable to them. Moreover, Nintendo’s products also has integrated parental controls for parents to allowing family members to enjoy games with peace of mind (see Table 4).

**Table 4: Social Innovation**

Social innovation	Social ecology	Society	Individual
Nintendo	Strict content guidelines, games comply local regulations and cultures	Incorporating games into school lessons to enhance learning	Game ratings systems for target age range, Integrated parental controls

Nintendo also utilized its unique strengths of hardware-software integrated development and its characters, beloved across generations, to incorporate games into school lessons (Nintendo, 2018). Nintendo achieves

social innovation by taking advantage of its accumulated experience and ability to create enjoyable experiences that keep consumers coming back for more (Nintendo, 2018). For example, the Wii Family Version allows whole family members to enjoy entertainment together and to improve social bonding. Its mission is bringing smiles to the community.

Based on the four innovation structure, Table 5 shows the proposed responsible innovation framework.

The proposed framework was developed based on the belief that we can collectively engage with the social, environmental, political and ethical dimension of responsible innovation. The goal of the framework is to provide guidance for practitioners, academics, policy makers to make research and innovation more inclusive and responsive. In line with Xu and Nash (2013), we view the four types of innovation as the structure of responsible innovation, but it is not one after another. Some cases may have commenced by business innovation, and some by social innovation, product innovation or process innovation. Hence, the steps are not neatly sequential stages, but that there is considerable iteration between steps. Table 5 shows circulating arrows to indicate iteration.

**Table 5: An Iterative Process in the Responsible Innovation Framework**

	Social ecology	Society	Individual
Product innovation			
Process innovation			
Business innovation			
Social innovation			

The framework enables managers to understand the extent to which a firm embraces moral, environmental, social, and governance factors into its innovation, and ultimately the impact these factors have on the firm and society.

**(3) Case example**

In this section, we will use a test case (Toyota) to illustrate the application of the proposed framework. As one of the world largest automakers, Toyota constantly facing great

pressure by its stakeholders (government, communities, NGOs, consumers, and employees) to response towards their need for a better product, environment and society. In another words, Toyota constantly enduring obligations throughout the entire process of a car manufacturing from idea generation until the disposal stage. The purpose of the case is to show how Toyota can collectively engage with the social, environmental, political and ethical dimension of responsible innovation.

**Table 6: Toyota’s Responsible Innovation Framework Example**

	<b>Social ecology</b>	<b>Society</b>	<b>Individual</b>
<b>Product innovation</b>	Smart mobility	Ethical supply chain	Fun to drive and zero casualties
<b>Process innovation*</b>	Recycling based society and system	Initiatives for traffic safety	Respect for individual
<b>Business innovation</b>	Enriching life of communities	Personal devices and self-driving technology.	High quality and environmental performance car for stress free driving
<b>Social innovation</b>	Contribute to local communities and reduced economic inequality	Distribute income to local people	Income and job security

\*See section 2.2 for Process innovation dimension

Corporate Social Responsibility (CSR) is core to Toyota in staying ahead of competitors and maintaining its position and reputation in the automotive industry (Toyota, 2018). The key is to balance its profits and the welfare of the society, consumers, and environment. The Kaizen philosophy is one of the Toyota core values that underpin product innovation. Designing a car that is fun to drive and at the same time to achieve zero casualties are two important objectives that Toyota committed fully. Toyota constantly continuously developing new safety technologies (i.e. Toyota Safety Sense),

and improving on existing ones to cover more and more products in the Toyota lineup (Beatty, 2018). Throughout the product development stages, Toyota maintain a genuine commitment to social responsibility and ethical business practices. In the long term, Toyota will meet the challenging goal of smart mobility by innovating vehicle technology to realize comfortable, convenient lifestyles that offer people peace of mind (Toyota Global, 2018).

In Toyota, CSR activities are implemented throughout the course of daily operations based on its corporate philosophy. Hence, Toyota is able

to integrate product and process innovation into business innovation to generate revenue as well as adding values to consumers through integrating services and solutions. For example, Prius, a low emission Toyota model using full hybrid powertrain technology is a high environment performance car. It provides highly educated and environmentally conscious consumers a stress free driving experience. Toyota also capitalizes on its superior competences in product and process innovation to develop commercial viable self-driving cars (Pham, 2018). Ultimately, one of Toyota's visions is to contribute to the safest, most responsible ways of transporting people and to enriching the lives of communities around the world (Toyota, 2018).

Today, Toyota also giving a large proportion of its profits back to local communities to achieve a healthier environment and reduce economic inequality (Toyota, 2018). In order to contribute to the society, Toyota has involved in various environmental and social innovation activities, including philanthropy, community relations, and diversity and inclusion (Mazzoni, 2014). Besides creating job opportunities for local communities through its global operations, Toyota also utilizes its global know-how to help nonprofits do more for the communities. This is a win-win social innovation strategy as it not only creates value in the communities, but Toyota also learn from people they partner with and bring learnings back into its business (Mazzoni, 2014).

All in all, this simple test case illustrates the feasibility of using the proposed framework to capture the essence of responsible innovation in Toyota. The proposed framework can underpin a practical and systematic approach for firms to better understand and support the governance of responsible innovation.

#### **(4) Discussion and conclusion**

Responsible innovation has a strong moral basis. In other words, innovations should happen in an ethical and democratic way while staying economic competitive during times of great socio-economic challenges (Nerlich & McLeod, 2016). The proposed framework (see Table 5) captures the essence of responsible innovation. The framework provides an umbrella linking various aspects of the relationship between products/innovation and society, public engagement, gender equality, ethics, and governance. The framework we developed is not the 'silver bullet' for responsible innovation. Traditionally, managers are too preoccupied with the product of innovation. The framework seeks to shape a constructive engagement between questions of innovations and responsibility, and allows managers to collectively embed science, social, ethic, governance, and equality early in the innovation process.

Clearly, researches about RI will become more prominent in the future because science and innovation have become very complicated at the global level and need to be addressed collectively. Science and technology, which was the focus of firms have lost the potential to create responsible innovation. Japan had learned to broaden the concept of innovation to encompass policy that lead to encompass the social sphere i.e. social ecology, society and individual. We have shown Japanese companies developed innovative and social responsible products through merging and integration of different technologies/science and business models. The inclusion of stakeholders inside and outside the companies, enables responsible innovation to occur at record speed.

Although, the concept of RI is straightforward and convincing, to put into practice firms need to be prepared to make changes in several operations strategy

dimensions (structural, infrastructural, cultural). Far too frequently innovation and engagement with the wider communities is carried out relatively informally. A formal framework provides a mechanism for mitigating this tendency by allowing managers/researchers to decompose the complexity of RI into manageable steps. Managers had different mental models of how their organisations, products and services operated, and might therefore make different opinions on the possible RI strategies. The Toyota illustrative case (Table 6) indicates that the framework is feasible and can be applied to undertake responsible innovation analysis systematically. It enables managers to explore innovation dimension and sustainability in depth while concurrently maintaining a visual and transparent trail, enhancing the rigour of the processes. The framework allows managers to visualise the RI dimensions and relationships with stakeholders. The framework provides a formal tool for iterative group discussion, where managers learn and modifying their understanding of RI, ideas, beliefs and even their thought processes over time. Application of the framework can provide a number of insights into aspects of RI which add to academic understanding and could form the basis of further work.

##### **(5) Limitations and future directions**

We have argued how the proposed framework can facilitate the generation and communication of RI. One limitation is that the framework is based on the discourse of literature and best practices and have not been empirically tested. The other obvious limitation is that the economic aspect of responsible innovation has not been included in the framework. We hope this paper will stimulate additional theory building and conceptual development within the RI discipline. Future research to test the RI

framework against reality should be carried out. In addition, a process to operationalise the framework is needed in order for practitioners and academics to utilise the framework effectively. Thus, a set of questions as well as steps to apply the framework should be developed.

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