

## Impact case study (REF3)

<b>Institution:</b> Kingston University		
<b>Unit of Assessment:</b> 17 – Business and Management Studies		
<b>Title of case study:</b> Enhancing innovation at Pirelli: Embedding Technology Roadmapping in the process of new product development		
<b>Period when the underpinning research was undertaken:</b> 2014 – 2019		
<b>Details of staff conducting the underpinning research from the submitting unit:</b>		
<b>Name:</b> Riccardo Vecchiato	<b>Roles:</b> Associate Professor	<b>Period employed by submitting HEI:</b> Sept 2014 – present
<b>Period when the claimed impact occurred:</b> 2014 – Dec 2020		
<b>Is this case study continued from a case study submitted in 2014?</b> N		

## 1. Summary of the impact

Vecchiato's research explored the implementation of Technology Roadmapping (TRM), a structured approach to identifying technological solutions needed to develop a product, in turbulent business environments. This research was taken up by R&D managers at global tyre manufacturer Pirelli, who:

- reviewed current processes and implemented innovative TRM practices at their company, increasing effective collaboration between different departments
- carried out and completed 10 TRM exercises, involving the direct participation of 96 R&D and product managers, and affecting 286 R&D projects
- stimulated new product development of 76 tyres, shortening time to market and maximising both usage and crossover of Pirelli's technological innovations
- facilitated entry into a new market (bicycle tyres) with the P Zero Velos tyres

## 2. Underpinning research

Despite growing investments in R&D and innovation, only a few companies manage to develop and launch new products that are successful: most companies experience high failure rates. Since 2014, Vecchiato has led research focused on the best practice for innovation in fast-paced, turbulent, uncertain environments. Vecchiato advocates for the use of product and technology roadmapping (TRM) as a managerial foresight technique in these turbulent business environments. A technology roadmap is a graphical representation of the coevolution over the course of time of technologies, products and markets in the form of a time-based chart, comprising a number of layers; these typically include both commercial and technological perspectives. A TRM involves a series of meetings and workshops that bring together managers and researchers from different organisational units to identify the key features of new technologies and products. Firms can use TRM in each stage of their innovation process for gathering and analysing, in a systematic way, knowledge about new technologies and customer needs.

Vecchiato's work has established the conceptual foundations, and an evidence base, for such an approach by examining the foresight practices that sustain innovation and development even in uncertainty. Using a case study methodology, he explored how two large companies coped with major changes and uncertainty in their industries **[R1]**. The research focused on how strategic planning can help decision makers cope with change, and on where more flexible approaches are more successful. He identified different kinds of uncertainty and the most relevant drivers of change for each company. A key finding was that firms only started using foresight techniques, like roadmaps, when decision makers had a sound grasp of all the components of their industry. Knowing the full boundaries of the business allowed decision makers to identify targets and risks for future growth, even in the known uncertainty of continuous change. Additional work by Vecchiato, using a multiple-case research design, has explored the role of managerial cognition in rival businesses' marketing competence **[R2]**.

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Further research explored the relationship between corporate foresight and strategic agility. Using empirical findings, Vecchiato found that organisations need to articulate, share and combine knowledge to sustain a competitive edge [R3]. This on-going learning maximises the use of present internal knowledge, and results in the continuous updating of future strategy. Research exploring how to enhance the learning benefits of foresight practices [R4] developed a planning methodology which was embedded into a biotech company's R&D investment decisions. Combining real options valuation with scenario planning, Vecchiato proposed an innovative model which offered evaluation of long-term profits with timely decision making.

An in-depth, longitudinal case study [R5] investigated the contributions of both cognitive dynamics and strategic decisions to business success in changing, turbulent environments. Vecchiato examined how foresight techniques can inform managerial beliefs, and thus contribute to the learning and the reactive decision making of managers. His findings showed that even though some major events had not been predicted through scenario planning, the planning process had enabled the company and its managers to adapt well to the unpredicted events. From these insights, he produced a conceptual framework illustrating the relationships between scenario planning, cognitive dynamics, and strategic decisions. His research has shown how companies can use TRM for systematically elaborating, in each stage of the innovation process, and how to identify the formal deliverables that support the decision regarding whether to move to the next stage of the roadmap.

As a result of this work, his insights were sought by members of the R&D team at Pirelli, the multinational tyre manufacturer. The figure below (from [S3]) shows an example of a TRM project for Pirelli's motorcycle business unit. This has resulted in their implementation of a framework inspired and directed by his research.

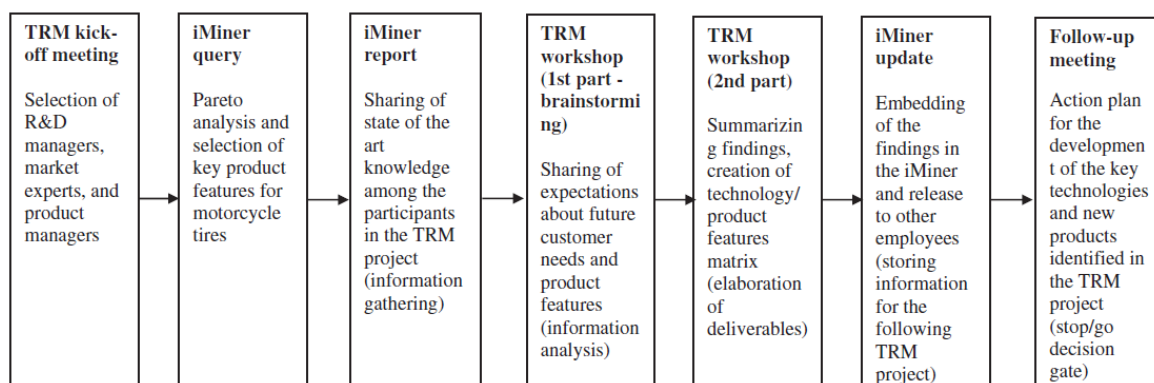


Figure 2. The TRM project for the motorcycle business unit of Pirelli.

### 3. References to the research

**R1 – Vecchiato, R.**, Strategic planning and organizational flexibility in turbulent environments, *Foresight*, 17, 3, (2014), pp 257 – 273. DOI: [10.1108/FS-05-2014-0032](https://doi.org/10.1108/FS-05-2014-0032) REF2ID: 17-104-1546  
Additional evidence of quality of research:

- This paper was the winner of the 2016 Emerald Literati Network Awards for Excellence.

**R2 – Vecchiato, R.**, 'Disruptive innovation, managerial cognition, and technology competition outcomes', *Technological Forecasting and Social Change*, 116, (2017), pp 116-128.

DOI: [10.1016/j.techfore.2016.10.068](https://doi.org/10.1016/j.techfore.2016.10.068) REF2ID: 17-101-1545

**R3 – Vecchiato, R.**, 'Creating value through foresight: First mover advantages and strategic agility', *Technological Forecasting and Social Change*, 101, (2014), pp 25 – 36.

DOI: [10.1016/j.techfore.2014.08.016](https://doi.org/10.1016/j.techfore.2014.08.016)

**R4 – Favato, G., Vecchiato, R.**, 'Embedding real options in scenario planning: a new methodological approach', *Technological Forecasting and Social Change*, 124, (2017), pp 135 - 149. DOI: [10.1016/j.techfore.2016.05.016](https://doi.org/10.1016/j.techfore.2016.05.016) REF2ID: 17-27-1475

**R5 – Vecchiato, R.** ‘Scenario planning, cognition, and strategic investment decisions in a turbulent environment’, Long Range Planning, 52, 5, (2019). DOI: [10.1016/j.lrp.2019.01.002](https://doi.org/10.1016/j.lrp.2019.01.002)  
REF2ID: 17-103-1543

#### 4. Details of the impact

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Vecchiato’s research on Technology roadmapping (TRM) has increased both the effectiveness and the efficiency of the innovation process at Pirelli, the multinational tyre manufacturer.

##### Introduction of TRM to Pirelli

Since the early 2010s, the growing complexity and changes in the tyre industry have resulted in Pirelli needing to revise their product development process: specifically, how knowledge was transferred from their research centres to their product divisions. Facing this challenge, in 2014, senior R&D managers of Pirelli reached out to and started to collaborate with Vecchiato, being familiar with his work at Milan in the early 2010s. A conference paper authored by three senior R&D managers at Pirelli explicitly mentions the work of Vecchiato as a key influence on their decision to adopt TRM and the bespoke way they designed and implemented it [S1], which led to the generation of ‘a new set of organizational capabilities’ [S2].

Application of the findings from the TRM research had the following foundational impacts:

- Contributing to Pirelli’s managers understanding of TRM and to their eventual decision to introduce TRM in their own company.
- Guiding Pirelli’s R&D managers to seamlessly integrate TRM into their overall innovation process, so that they could better face the growing turbulence of their business environment.
- Underpinning Pirelli’s design and implementation of an innovative approach to TRM, bespoke to the specific needs of this company.

One of Pirelli’s R&D managers stated that the ‘research of Dr Vecchiato contributed to changing our process of new product development and enhancing the effectiveness of this process’. He also explained how the research ‘affected in particular the way we gather information about the evolution of new technologies and markets, we analyse this information, and elaborate the deliverables that guide the decision to move from one stage of our new product development process to the next’ [S2].

##### Implementation of TRM at Pirelli

TRM is critical to the stages of Pirelli’s innovation process, from initial idea generation to the final post-launch review. With more than 1,800 R&D and innovation managers, the implementation of TRM has directly impacted many stakeholders at Pirelli [S3]. The key changes resulting from Vecchiato’s research include [S2]:

- The redesign of information gathering: from an informal and unstructured process to a formal, methodical process. This improves access to the existing pool of knowledge available within the whole company and grows knowledge collection.
- The redesign of information analysis: from an unstructured process with limited dialogue and knowledge sharing to a continuous, systematic process that expands the initial set of data available in the company and improves the understanding of these data.
- The redesign of elaboration of deliverables: from an unstructured process with limited integration of expertise among specialists and managers to a methodical process where managers’ assumptions about future products and markets are explicit and shareable.

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Research by Vecchiato contributed to the decision of Pirelli's R&D managers to create a database, the iMiner, which would provide a complete repository of the company's R&D and innovation knowledge. This common-language, shared information repository supported the implementation of TRM by uniting workshop and meeting participants from different business units and geographic locations, such as: researchers, technologists, marketing managers, strategic planners and product specialists, enabling them to better share knowledge.

As a result, Pirelli has increased the number of new products it develops, has accelerated the time-to-market, and increased the exploitation of technological synergies between different product platforms. In the last two years (March 2018 – March 2020), 10 TRM exercises were completed within the company, involving 96 R&D and product managers - benefitting 286 R&D projects and the development of 76 new tyres. In the same period, 273 R&D and innovation managers directly accessed the iMiner at least once; and the database was accessed a total of 84,038 times [S4].

### TRM and New Product Development: the example of the P Zero Velos

The most significant new product guided to market by the TRM was Pirelli's P Zero Velos. These were also Pirelli's entry into the bicycle tyre market [S5]. A co-authored review remarks 'A major outcome of the MOTO tires technology-product roadmap was the development of a new product, that is, the P ZERO™ Velo, the commercialization of which officially started in September 2017. TRM helped Pirelli's managers seize the opportunity to enter this growing market by exploiting some of the technological and brand skills that the company had already developed in its existing businesses' [S3]. At a TRM workshop, participants identified the product features and the technologies that could be easily transferred from the car and motorcycle product platforms, such as the patented, all-weather SmartNET™ Silica compound. TRM accelerated the development and commercialization to just 15 months, compared to the average 24 months. Cycling Weekly summarised how 'Pirelli has bundled up a collection of its most confidence inspiring, automotive knowledge, and filtered it all into a tyre for road cyclists' [S6]. The Mitchelton-Scott team raced with these tyres in the 2018 Tour de France; the tyres are available for public purchase, at around £30.00 per tyre.

### Integration of TRM into Pirelli's Innovation Strategy

The role of TRM in the overall innovation process of Pirelli has been integrated in the strategic objectives of enhancing cost competitiveness and fostering technological competitiveness. A presentation at the 2019 STIM Consortium illustrates product innovation at Pirelli, by emphasizing the role of TRM as one of the 'key enabling factors' in the overall innovation efforts of the company [S7]. The 2020-2022 Industrial Plan highlights the innovation and technology development strategy of the company for the next three years and explicitly mentions TRM and its role in designing the overall product roadmap of the company [S8].

## 5. Sources to corroborate the impact

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**S1** – Motta V., Amati G., Motta M., Tebano R., 'Technology Roadmapping: integrating technology resources into business decision making. Pirelli Tyre Case Study', (2015). [Paper presented](#) at the 2015 R&D Management Conference.

**S2** – Testimonial by a Pirelli R&D manager

**S3** – G. Amati, V. Motta, R. Vecchiato. 2020. "Roadmapping for Innovation Management: Evidence from Pirelli". R&D Management, 50 (4). DOI: [10.1111/radm.12398](https://doi.org/10.1111/radm.12398)

**S4** – [Pirelli's Approach to Technology Roadmapping](#) - An Interview with R&D Today

**S5** – [P Zero Velo Product Page](#)

**S6** – [Cycling Weekly Review of P Zero Velo Tyres](#)

**S7** – Presentation of Pirelli's R&D managers at the STIM (Strategic Technology & Innovation Management (STIM) Consortium), Cambridge, 2019

**S8** – [Pirelli strategy deployment: pillar 3 – technology-based innovation](#), 2020-22 Industrial Plan, Vision 2025