

The Monitoring Canvas: a Tool for Co-Creating Actions in Mission Oriented Innovation Policies

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1 ABSTRACT

Recent years have seen a surge of “missions” in innovation policy. The grand, and seemingly overwhelming challenges humanity faces at the beginning of the 21st century, are typically cited as the driver behind this shift. With mission-oriented innovation policies (MOIP), policymakers choose a top-down perspective, while at the same time granting “embedded autonomy” to all actors involved: A bold and well-defined challenge is set, that gives direction to the aspired transformation and bottom-up experimentation by a large field of actors will need to solve the myriad of tasks left open. Thus, successful MOIPs will need to spark activity in multiple sectors and disciplines and keep actors involved over a long period and throughout a demanding transformation process. We present a tool for co-designing concrete actions, the smallest parts of a MOIP. We argue that due to the long timeframe of MOIPs and – if successful – the constantly changing innovation landscape, it is essential that all actors involved have a clear perception of how their actions contribute to the targets of the MOIP. By collecting the very basic information on the context for an action, the action itself, and indicators that show whether or not an action creates an output as desired, the Monitoring Canvas secures transparency for all parties involved and allows for the continuous modification of an action. Thus, the Monitoring Canvas is not a comprehensive monitoring and evaluation system, but rather its “front end” – designed for high usability.

Keywords: action, MOIP, innovation, challenges, monitoring canvas

2 INTRODUCTION

For many policymakers around the globe, the 21st century is characterized by a set of “grand challenges”. They are “grand” or “wicked” because the challenges originate from ethical and moral dilemmas inherent in modern lifestyles (Ferraro et al. 2015, Keitsch 2018). Thus, to address these challenges is to transform (parts of) social systems. The challenges of today include (but are not limited to): fighting hunger as well as cancer, cleaning up the oceans, create gender equality, battling the climate crisis, and securing biodiversity (Mazzucato 2018, Lawson & Martin 2020). International organizations (e.g. United Nations: Sustainable Development Goals), transnational unions (e.g. European Union: EU-Missions of the Horizon Europe framework), government agencies (e.g. Austrian Federal Ministry for Climate Action: Mobility of the future), and cities (e.g. Amsterdam: Smart City Innovation Mission) have recently agreed on missions and have set targets to spark innovation, investments and a widespread engagement of the public (Janssen et al. 2021, Laure 2021).

This shift in innovation policy requires new skills and tools by and for policymakers (Laure 2021, Mazzucato et al. 2019). In this paper, we present a tool for co-creating actions and indicators (the smallest parts of MOIPs) in one integrated process. Section 3 briefly introduces mission-oriented innovation policies. In Section 4, we show the larger process of implementing a MOIP based on the framework of policy roadmapping as proposed by Miedzinski, Mazzucato & Ekins (2019). In Section 5, we introduce the Monitoring Canvas as a participatory tool and show how it is embedded in the overall process policy roadmapping. Section 6 presents a fictional design created with the Monitoring Canvas and section 7 concludes and points at directions of further research.

3 MISSION-ORIENTED INNOVATION POLICY

The climb of MOIPs on all governmental levels has prompted researchers to warn both about overly optimistic hopes on what they can achieve and about the danger that stakeholders might feel overwhelmed by the ambition and complexity of a “mission” (Laure 2021: 12). There are two possible sources for these pitfalls, inherent in the history of MOIP and innovation policy in general: First, there have been (although in many ways not comparable) tremendously successful missions in the past. Second, there is a large body of

literature on how past innovation policies have failed. In this section, we introduce both threads, show which requirements have been formulated in response and their relevance to contemporary MOIPs.

3.1 Successful missions

Like many contemporary methods, terminologies, and planning approaches, missions have a strong connection to military applications and the dawn of the space age. Probably the best known of all “missions” are the Apollo Program and the Manhattan Project (Ergas, 1987, Leslie 1993, Mazzucato & Perrez 2015). However, these missions were different.

These “old type of MOIPs” were predominantly technological endeavors. Like in contemporary missions, the administration set the agenda and was willing to deploy large-scale investments. But contrary to “new” MOIPs, the number of actors was relatively small and homogenous (a large group of experts). The idea for a new understanding of missions is attributed to the nuclear physicist Alvin M. Weinberg. In his Reflections on Big Science Weinberg insisted, that science could go beyond mere technological ends and address “big problems”. The big problems Weinberg had in mind in the mid-sixties of the past century, included the increasing environmental pollution and the difficult relationship between science and society (Weinberg 1994).

The diffusion of Weinberg's idea owes to a connection made in documents like the Maastricht Memorandum, in which the authors argued that using innovation and technology policy to solve “big problems” would – as a positive side effect – result in competitive advantages in a globalized world (Soete & Arundel 1993: 93-94). This idea of a “green economy” is constitutional to the reasoning behind the new type MOIPs (Kemp & Soete 1990).

Old: Defence, Nuclear and Aerospace	New: Environmental Technologies
The mission is defined in terms of the number of technical achievements with little regard to their economic feasibility.	The mission is defined in terms of economically feasible technical solutions to particular environmental problems.
<ul style="list-style-type: none"> - The goals and the direction of technological development are defined in advance by a small group of experts. - Centralized control within a government administration. - Diffusion of the results outside of the core of participants is of minor importance or actively discouraged. - Limited to a small group of firms that can participate owing to the emphasis on a small number of radical technologies. - Self-contained projects with little need for complementary policies and scant attention paid to coherence. 	<ul style="list-style-type: none"> - The direction of technical change is influenced by a wide range of actors including government, private firms and consumer groups. - Decentralized control with a large number of involved agents. - Diffusion of the results is a central goal and is actively encouraged. - An emphasis on the incrementalist development of both radical and incremental innovations in order to permit a large number of firms to participate. - Complementary policies vital for success and close attention paid

Table 1: Characteristics of Old and New "Mission-Oriented" Projects (Source: Soete & Arundel 1993: 51)

The transition (from technological missions to those that want to change parts of society) is not a self-evident one. As a result, many case studies on “new” MOIPs have been conducted in recent years (see the STIP database by the OECD¹). Like a rocket capable of bringing a human being to our close astronomical neighbor, missions to change society are seen as very complex design problems. The design problem is opening an “ecosystem” that allows not just one, but many different paths toward a certain future, target or goal. In more detail, a new ecosystem creates and shapes new markets that have a certain “directionality” and inspires spending and enthusiasm by both public and private actors. Three essential dimensions have been defined for new MOIPs:

(1) Strategic orientation: Whatever the mission, it has to be such, that it engages a very large part of society. If the targets of the mission are accepted, then necessary resources can be attracted.

¹ <https://stip-pp.oecd.org/stip/knowledge-transfer/case-studies>

(2) Policy coordination: The efforts made toward the set goals have to be consistent. Public and private actors (how to accept the mission) have to coordinate so that their actions do not undermine the actions of other actors.

(3) Policy implementation: Across sectors, policies that have been implemented have to be constantly monitored and evaluated, if they work toward the desired direction.

These three points are very challenging indeed. Unlike purely technological or “old” MOIPs all these points will have to be co-defined by many (and an ever-increasing number, if the mission is successful) stakeholders (Foray et al. 2012).

3.2 A succession of failures

In the light of these enormous challenges and looking back at past efforts, researchers and practitioners came to conclude, that past efforts in research, innovation, and/or industrial policy were largely a succession of different kinds of failures. Although it is acknowledged, that the public sector did play a role in shaping markets in the past, it is a point of discussion, what exactly this role has been (Edler & Georghiou, 2007). Preez (2013) concludes that policies supported the growth of suburbs and mass production that new missions want to challenge.

Failures have been connected to many origins. Free markets could not work as smoothly as expected (market-failures, Rodrik 2008). Governments, acting with the best of intentions, might produce positive effects, but at the risk of creating large-scale crises (government-failure, Rodrik 2008). Finally, aspired transformations could fail to materialize, due to the inner workings of the public sector and its connections to the society (transformational system-failure, Weber 2012).

4 MISSION-DRIVEN POLICY ROADMAPPING

The success of old MOIP sparked research on case studies of successful and failed missions (Mowery, 2010) and more recently led to the development of first tools and toolkits to the design the process of implementing an MOIP (Miedzinski et al. 2019, Larrue 2021; in more general terms see the OECD toolkit navigator²). We propose that the Monitoring Canvas can be integrated in the larger context of implanting an MOIP. It covers the smallest part of an MOIP – creating a single action and finding ways to monitor its performance – and it can be used, to co-create actions for the target(s) of the MOIP. We build on the MOIP policy roadmapping framework as proposed by Miedzinski et al. (2019) to show where and how the Monitoring Canvas can be useful. We deliberately chose not to connect the Monitoring Canvas to the Mission Design Canvas by the OECD (OECD 2021), because (1) of the different levels they address, (2) that it is in our view not possible to use them together in one workshop (although we want to encourage experimentation to combine them in a succession of workshops) and (3) the advantage of having one subject displayed on a single sheet would be lost. The Monitoring Canvas covers the smallest parts of MOIPs, but they are important none the less: Successful MOIP consists of a collage of actions by various actors (Vassolakou et al. 2021). Due to this inherent complexity, it is critical for all actors involved to understand exactly how their engagement is contributing to a new future. Thus, a tool that draws out this very basic relation can be crucial.

4.1 Policy roadmapping for MOIP

Miedzinski et al. 2019 present a framework for implementing a MOIP based on the concept of “roadmapping” (Galvin 1998). Roadmaps allow planning into the (distant) future, by collecting knowledge from a large number of involved actors. Roadmaps are graphic representations that align certain targets on a timeline (Phaal et al. 2004). The process of designing a MOIP roadmap involves multiple stakeholders, involves knowledge about the current state of the (social) system where the transformation should take place, and runs over many months or years (Miedzinski et al. 2019: 24 - although Fastlane-processes have been presented to create a MOIP in 100 days). Once implemented, a constant process of policy learning has to start, to further develop the MOIP and adjust to the changing context. Table 2 connects the basic design principles of MOIP (see above) with the roadmapping framework and the process of creating an MOIP.

² <https://oecd-opsi.org/toolkit-navigator/>

MOIP design principles (Laurre 2021: 17)	MOIP roadmapping framework (Miedzinski et al. 2019: 37)	Process of MOIP roadmapping (Miedzinski et al. 2019: 37)							
<table border="1"> <tr> <td>Strategic Orientation</td> <td>Informing and selecting specific societal challenge(s) and strengthening legitimacy of focused policy intervention towards clear and precise objectives</td> </tr> </table>	Strategic Orientation	Informing and selecting specific societal challenge(s) and strengthening legitimacy of focused policy intervention towards clear and precise objectives	<table border="1"> <tr> <td>Grand challenge and mission</td> <td></td> </tr> </table>	Grand challenge and mission		<p>Scoping: The process of agreeing on the broad challenge that will be addressed by the roadmap. Key-partners need to be engaged in the mission and share to common agenda.</p> <p>Baseline: To empirically ground the mission, data needs to be retrieved on the current state of the selected problem. This involves not only the data on the problem, but also on the social-technical system (the innovation- and policy landscape).</p> <p>Vision and goals: At this stage, a common vision and distinct goals are created. They have to be inspirational and bold, but at the same time achievable. Interim targets are located on the roadmap and “hot spots” for the transformation identified.</p> <p>Innovation pathways: For the “hot spots” selected, innovation pathways are developed. A mix of innovations is developed and are placed on the roadmap to visualize alternative innovation pathways.</p> <p>Policy roadmap: Concrete targets (goals) are set and timelines for actions are developed. Public and private actors necessary for achieving the goals are identified. Finally, monitoring mechanisms are developed.</p> <p>Policy learning: Governance mechanisms have to be established, so all parties involved have an overview of the current situation. Capacity building is required to allow for data-collection and analysis.</p>			
Strategic Orientation	Informing and selecting specific societal challenge(s) and strengthening legitimacy of focused policy intervention towards clear and precise objectives								
Grand challenge and mission									
<table border="1"> <tr> <td>Policy co-ordination</td> <td>Coordinating the strategies and activities of the different institutions involved in the policy</td> </tr> </table>	Policy co-ordination	Coordinating the strategies and activities of the different institutions involved in the policy	<table border="1"> <tr> <td>Innovation pathways</td> <td>Innovation strategies</td> </tr> <tr> <td></td> <td>Enabling systems</td> </tr> </table>	Innovation pathways	Innovation strategies		Enabling systems		
Policy co-ordination	Coordinating the strategies and activities of the different institutions involved in the policy								
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<table border="1"> <tr> <td>Policy implementation</td> <td>Ensuring he consistency and effectiveness of the modes of intervention and resources of the public and private partners mobilised to achieve the policy objectives</td> </tr> </table>	Policy implementation	Ensuring he consistency and effectiveness of the modes of intervention and resources of the public and private partners mobilised to achieve the policy objectives	<table border="1"> <tr> <td>Policy Roadmap</td> <td>Policy action plan</td> </tr> <tr> <td></td> <td>Governance</td> </tr> <tr> <td></td> <td>Learning and capacity building</td> </tr> </table>	Policy Roadmap	Policy action plan		Governance		Learning and capacity building
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	Learning and capacity building								

Table 2: Criteria, principles and process of MOIP roadmapping.

4.2 Using the Monitoring Canvas

The Monitoring Canvas can be used in Steps 5 and 6 (see table 2, right) in the roadmapping process. Miedzinki et al. 2019 suggested that workshops would be a fitting method. The idea behind the canvas is that it is essential for all partners involved to (1) have a shared understanding of how actions are measured and (2) their commitment does affect the transformation. Using the Monitoring Canvas, short and medium-term actions are developed together with ways to monitor their success. In step 6 (policy learning), the Monitoring Canvas can be used to re-align actions within a changed system or context.

5 CO-TREATING ACTIONS, TARGETS AND INDICATORS. THE MONITORING CANVAS

The Monitoring Canvas is a tool and temple for co-creating actions in the context of MOIP. It can be used to design new actions as well as for reviewing existing ones. On a single (virtual) page, it offers an overview of the action, embedded in its larger context and ways all collaborates can check if their commitment contributes to achieving the set target. The canvas consists of eight building blocks aligned in lines and columns (Fig. 1). Thus, the Monitoring Canvas is a tool for participatory engagement and extensively builds on successful existing templates like the Business Model Canvas as proposed by Oswalder et al. (2010) and especially its recent adaption for MOIP by the OECD (OECD 2021). However, unlike its predecessors, the Monitoring Canvas covers only a single action and not an entire mission (or business).

The Canvas connects one action with indicators that show if it is successful or not. However, the Canvas is not a sound monitoring system in itself, but only a first step toward it. Furthermore, because only a single action is covered by one Monitoring Canvas, it is not possible to study the consistency and coherence within the policy mix of a MOIP (Kemp & Pontoglio 2011, Reichardt & Rogge 2016).

In what follows, we present seven steps to work with the Monitoring Canvas. The steps work as a guideline for workshops. We encourage hosts to modify or rearrange these steps (together with the participants) to best suit their needs. This process of working with the Monitoring Canvas is the result of internal discussion and fictional designs by the authors and external collaborators. Figure 2 provides an overview of the steps, locates them on the Monitoring Canvas, and provides guiding questions for each step. The steps are detailed out below as an orientation for working with the canvas:

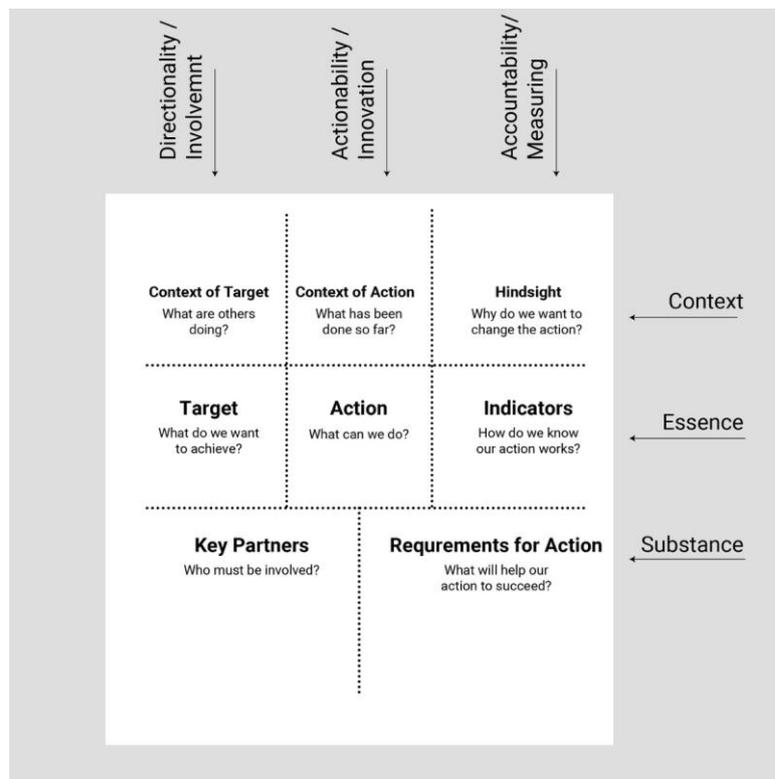


Fig. 1: The Monitoring Canvas (with labels for lines and cloumns).

5.1 Select a target (or goal) form policy roadmap (Step 1)

Considering the participants of the co-creation workshop, choose a mission or target from the MOIP best suited for the present group. It can be helpful to do this in advance: to make sure that the necessary partners are invited and participants can prepare for the workshop.

5.2 Discuss the context of the target (Step 2)

More often than not, you will encounter a situation where other actors are already working toward similar targets, or even your group or organization has done so in the past (Miedzinski et al. 2018). This can be a chance to align with other missions and/or to focus or adjust your action (this is especially true if you use the Monitoring Canvas for reviewing your roadmap). Discussing the context of your target is important to understand why prior actions did not work as desired and what you can do to inspire better results.

5.3 Discuss the context of actions and reflect on their success (Step 3)

Review past actions and discuss their success and reasons why they performed below initial expectations. Did they inspire enough partners? Was the direction of the transformation shared and clear to all parties involved? Were they too ambitious or not courageous enough?

5.4 Create an Action (Step 4)

The term action refers to the (policy) instrument or activities (or a combination of instruments/activities) that the co-creating group can use to contribute to the transformation toward the selected target. Actions work best, when they are open to multiple development paths and types of solutions (Mazzukato 2018: 812). Thus, they need to be easily understandable for all actors (some of them possibly present at the co-creation workshop) and, although ambitious, within their capabilities.

5.5 Build relationships (Step 5)

Nobody is solving missions alone - the same is true for actions. A successful action requires the commitment and contribution of all partners involved. Consider both options: partners where established networks or relations exist and new ones (that need to be approached and informed about the MOIP, the concrete action, and their possible role). The bottom-up nature of MOIPs on this level implies that some adjustments will be necessary, once new perspectives join the process.

5.6 Understand requirements (Step 6)

Working on the requirements of the action is to detail your design – to make sure that it is not only a good idea but that it works in the present context and that the parts add up to a larger whole. At this stage, identify drivers, enabling factors, and the barriers to your action. You will find drivers and barriers across the spectrum of the desired change: from technological problems or missing links to the level of culture and values that do not align to the mission target (Miedzinski 2016). It is important to outline co-benefits for all partners associated with the alternative innovation pathways.

5.7 Set indicators (Step 7)

All partners have to understand the connection between the created action and the indicators to measure its success. They need to be able to see how their contribution advances the transformation process. Thus, designing indicators is providing ongoing guidance along a path that is largely unknown to all partners involved. Clear indicators will secure the engagement of the partners involved and can spark interest in new parties.

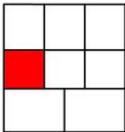
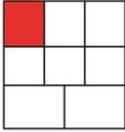
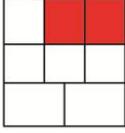
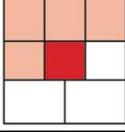
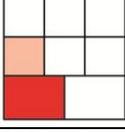
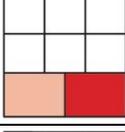
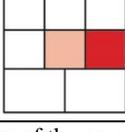
Design steps (work with iterations)	On Canvas	Key questions for discussion Considering the people involved (present at the workshop)
Step 1. Select a target from policy roadmap		Which target (goal) from the policy roadmap do we want to address? <i>Cross-check:</i> Can we realistically create an impact concerning the target?
Step 2. Discuss the context of the target		Are there other programs (in other sectors or policy levels) already working toward similar targets? <i>Preview:</i> Can we cooperate/align with other actors from other programs? (Step 5)
Step 3. Discuss context of past actions and reflect on their success		Are there actions in the past (we have set)? <i>Review:</i> Why were they below initial expectations?
Step 4. Create Action		What can we do, to open multiple innovation pathways toward the target selected?
Step 5. Build relationships		Who are the key partners across sectors and disciplines that need to be involved? <i>Cross-check:</i> Do key partners share our vision and especially the target selected?
Step 6. Understand requirements		What is needed for the success of the action? <i>Reflect:</i> Are there co-benefits for the actors involved?
Step 7. Set indicators		How can we know our action works? <i>Detect:</i> Do we have the necessary data?

Fig. 2: Overview of the co-creative process working with the Monitoring Canvas

6 FICTIONAL DESIGN: AN EDUCATION ALLIANCE FOR CLIMATE NEUTRAL MOBILITY

Below we present a fictional design for an action in the context of the circular economy. We chose the context of Vienna, Austria for this fictional design. We worked with experts on the reuse and recycling of building materials in a virtual workshop³. The Canvas below (Fig. 3) is the result of this workshop.

³ The authors would like to thank DI Stefan Bindreiter, DI Andreas Gassner, and Dr. Julia Forster for participating in the virtual workshop.

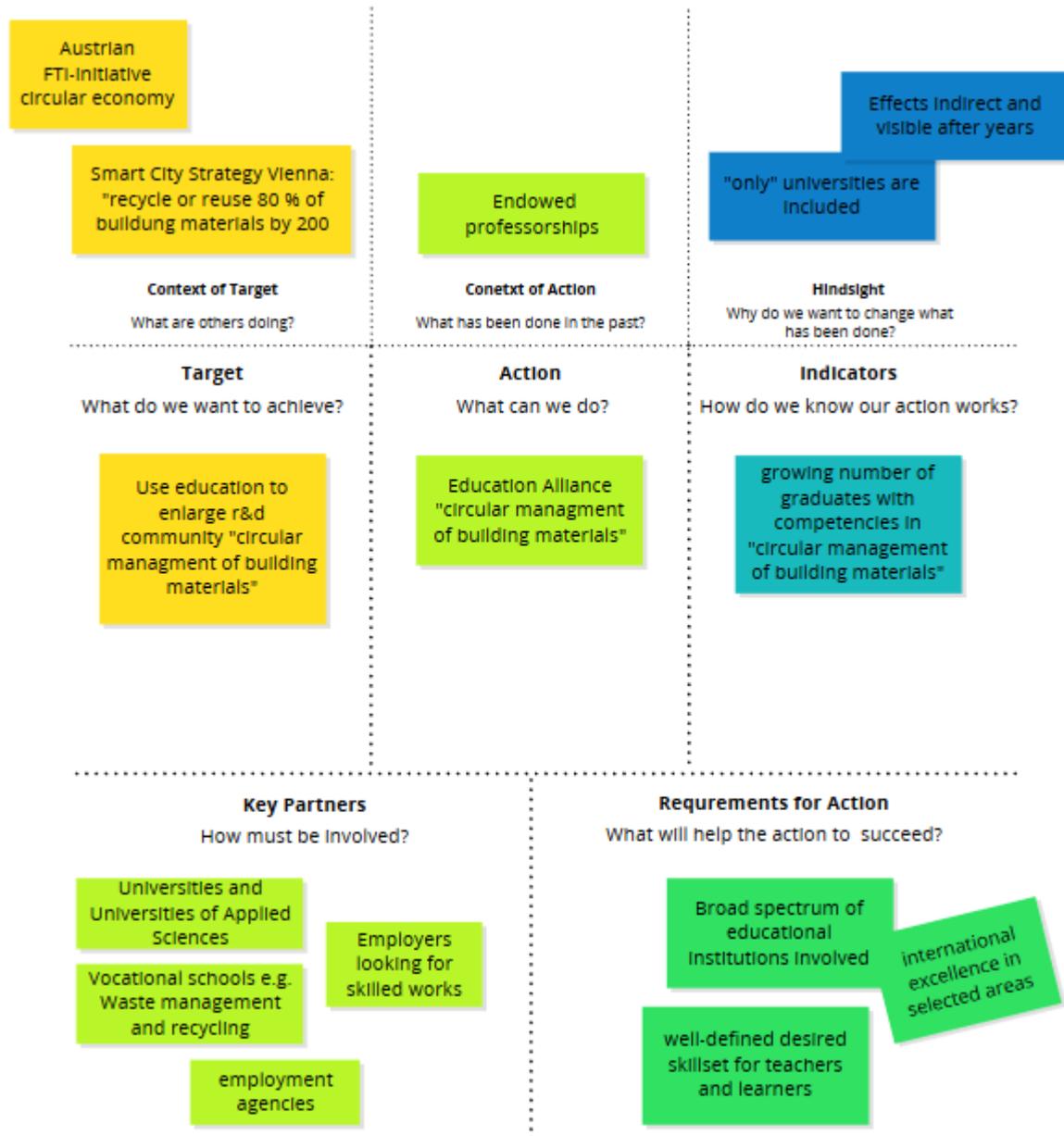


Fig. 3: Example of a completed Monitoring Canvas (fictional design co-produced with the support of experts in the field)

7 CONCLUSION

We have presented the Monitoring Canvas as a supplement to existing toolkits for the creation MOIP. As we have pointed out above, it covers the smallest parts of an MOIP, the single action, and although it shows ways to understand if the action is successful or not, it must not be mistaken for a comprehensive monitoring or evaluation system. The Monitoring Canvas is a participatory tool and as such, we hope, helpful to engage and bond the necessary large number of stakeholders. So far, the Monitoring Canvas has very little capabilities to check the consistency of one action with others in the same MOIP. Although perfect coherence and consistency are impossible to achieve (Carbone 2008; Reichardt & Rogge, 2016), this is certainly a point for further elaboration. The honest chance that a certain set of partners is capable of achieving a certain target, has been pointed out as important, not only to engage other actors but also for the overall success of the mission Bödeker & Rogge (2014). Currently, there is no way to check the Monitoring Canvas for the credibility of its results. Thus, we think that a very close relation to the second step (baseline)

of the roadmapping framework has to be secured. Working with sound evidence is absolutely necessary use this participatory tool in the larger context of an MOIP.⁴

8 REFERENCES

- Bödeker, P. & Rogge, K. (2014). “The Impact of the Policy Mix for Renewable Power Generation on Invention: a Patent Analysis for Germany”, 15th ISS Conference of the International Schumpeter Society, Jena.
- Carbone, M. (2008). Mission impossible: the European Union and policy coherence for development. *European integration*, 30(3), 323-342.
- Edler, J., Georghiou, L. (2007). Public procurement and innovation - Resurrecting the demand side, *Research policy*, 36(7), 949-963.
- Ergas, H. (1987). “Does technology policy matter”, in Brooks, H. & Guile, B. R. (eds.), *Technology and Global Industry: Companies and Nations in the World Economy*. pp. 191-245.
- Ferraro, F., Etzion, D., & Gehman, J. (2015). Tackling grand challenges pragmatically: Robust action revisited. *Organization Studies*, 36(3), 363-390.
- Foray, D., D. Mowery & Nelson, R. R. (2012). “Public R&D and social challenges: what lessons from mission R&D programs?”, *Research Policy*, 41(10), 1697-1902.
- Galvin, R. (1998). Science roadmaps. *Science*, 280(5365), 803-804.
- Keitsch, M. (2018). “Structuring ethical interpretations of the sustainable development goals—Concepts, implications and progress”, *Sustainability*, 10(3), 829.
- Kemp R. & Soete L. (1990), “Inside the green box: On the economics of technological change and the environment”, in Freeman C. & Soete L. (eds.) *New Explorations in the Economics of Technical Change*. London: Pinter.
- Kemp, R. & Pontoglio, S. (2011), “The innovation effects of environmental policy instruments — A typical case of the blind men and the elephant”, *Ecological Economics*, 72 28-36.
- Janssen, M. J., Torrens, J., Wesseling, J. H., & Wanzenböck, I. (2021). “The promises and premises of mission-oriented innovation policy – A reflection and ways forward”, *Science and Public Policy*, 48(3), 438-444.
- Larrue, P. (2021). The design and implementation of mission-oriented innovation policies: A new systemic policy approach to address societal challenges. OECD Science, technology and industry policy papers, OECD publishing.
- Lawson, J., & Martin, C. (2020). “Review of selected works by M. Mazzucato and colleagues on states, market shaping and value”, *Housing, Theory and Society*, 37, 251-254.
- Leslie, S. W. (1993). *The cold war and American science: The military-industrial-academic complex at MIT and Stanford*. New York: Columbia University Press.
- Mazzucato, M. (2018). “Mission-oriented innovation policies: challenges and opportunities”, *Industrial and Corporate Change*, 27(5), 803-815.
- Mazzucato, M., Kattel, R., & Ryan-Collins, J. (2020). “Challenge-driven innovation policy: towards a new policy toolkit”, *Journal of Industry, Competition and Trade*, 20(2), 421-437.
- Mazzucato M & Perez C. (2015). “Innovation as Growth Policy”, in: Mazzucato M & Perez C. (eds.), *The Triple Challenge for Europe*. Oxford University Press, Oxford, pp 229-264.
- Miedzinski, M. (2016). *System Climate Innovation for a Transformative Impact*, Climate Innovation Insights, Series 1.3. Accelerating the Evolution of Climate Innovation Clusters, Climate-KIC.
- Miedzinski M., Kemp R. & Türkeli, S. (2018). “Policies for eco-innovation and green economy”, in: Kemp, R. et al, *Maastricht Manual on Measuring Eco-Innovation for a Green Economy*, Deliverable 2.5 of H2020 green.eu project
- Miedzinski, M., Mazzucato, M., & Ekins, P. (2019). A framework for mission-oriented innovation policy roadmapping for the SDGs: the case of plastic-free oceans.
- Mowery, D. C., Nelson, R. R., & Martin, B. R. (2010). Technology policy and global warming: Why new policy models are needed (or why putting new wine in old bottles won't work). *Research Policy*, 39(8), 1011-1023.
- OECD (Organisation for Economic Co-operation and Development) (2021). *Remixing the Mission Design Canvas*. Online: <https://oecd-opsi.org/remixing-the-mission-design-canvas/>
- Osterwalder, A., Pigneur, Y. & Clark, T. (2010). *Business Model Generation: A Handbook For Visionaries, Game Changers, and Challengers*. Strategyzer series. Hoboken, NJ: John Wiley & Sons.
- Phaal R., Farrukh C., Probert D. (2004). “Technology roadmapping - A planning framework for evolution and revolution”, *Technological Forecasting and Social Change*. Vol 71 (1-2): 5-26.
- Perez, C. (2013). “Financial bubbles, crises and the role of government in unleashing golden ages” in Pyka, A. & Burghof, H-P. (eds.), *Innovation and Finance*. Routledge: London.
- Reichardt, K. & Rogge K. (2016). “How the policy mix impacts innovation: Findings from company case studies on offshore wind in Germany”, *Environmental Innovation and Societal Transitions*, 18 62-81.
- Rodrik, D. (2008). “Industrial Policy for the Twenty-first Century”, in *One Economics, Many Recipes*. Princeton: Princeton University Press, pp. 99-152.
- Soete, L., & Arundel, A. (1993). An integrated approach to european innovation and technology diffusion policy (a Maastricht memorandum). EUR (Luxembourg).
- Vassoloukou, M. Russ, M. & Lenz, B. *Wie Europas Smart Cities klimaneutral werden*, Tagesspiegel Background. Online: <https://background.tagesspiegel.de/digitalisierung/wie-europas-smart-cities-klimaneutral-werden>
- Weber, M. and Rohrer, H. (2012). “Legitimizing research, technology and innovation policies for transformative change”, *Research Policy* 41: 1037-1047.
- Weinberg, A. (1967). *Reflections on Big Science*. Cambridge (MA): The M.I.T. Press.
- Weinberg, A. (1994). *The First Nuclear Era: The Life and Times of a Technological Fixer*. New York: AIP Press

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