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# Roadmapping Roadmapping: Strategic planning for roadmapping systems

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**Abstract** Roadmapping is a well-established technique in the context of innovation and strategy, with the potential to support organizations address the complex transformative challenges facing humanity in the 21st century. This is enabled by its systems-based architecture and visual form of roadmaps, supporting communication and reduction of information asymmetries in complex sociotechnical systems. This paper focuses on an adaptation of the roadmapping method to support strategic planning for roadmapping systems in organizations, addressing implementation challenges. This represents a novel application of roadmapping to business processes and systems, demonstrating the flexibility of the roadmapping approach. A workshop template ('R2') and process for supporting the roadmapping of roadmapping systems is presented, developed and refined through a series of six industrial cases, and illustrated with an application example in the additive manufacturing sector.

**Keywords** roadmapping, strategic planning, innovation management

## 1 Introduction

Humanity faces systemic sustainability challenges in the 21st century relating to global warming, environmental protection, biodiversity, food production and healthcare. Addressing such challenges requires an orchestrated response, in terms of common purpose and actions, within and between organizations, regions and nations. Increased levels of functional alignment, systems integration and temporal synchronization are required of our

innovation systems to transition to more sustainable models (Geels and Schot, 2007). Roadmapping is a practical strategic approach that can support these goals (Vinayavekhin and Phaal, 2019), enabled by its dynamic systems architecture, enabling communication and reducing information asymmetries in complex sociotechnical systems.

Roadmapping is well-established practice in industry, having emerged in high tech sectors in the USA in the 1960s (Kerr and Phaal, 2020), such as aerospace, semiconductor and energy sectors. The approach was popularized by Motorola in the 1980s (Willyard and McClees, 1987) and spread rapidly in the electronics industry at both firm (Groenveld, 1997) and sector levels (Kostoff and Schaller, 2001) and to other manufacturing sectors and beyond. This is due to the holistic systems nature of the approach (Kerr, 2023), its visual nature (Kerr and Phaal, 2015) and flexibility (Lee and Park, 2005).

Kerr and Phaal (2022) have provided the following general definitions for roadmap as artifact, and roadmapping as process: "A *roadmap* is a structured visual chronology of strategic intent," and "*Roadmapping* is the application of a temporal-spatial structured strategic lens." The 'chronology' term in the roadmap definition emphasizes the explicit time dimension of roadmaps (often missing or implicit in strategy frameworks and tools), together with the narrative aspect involved in the development and communication of roadmaps, supported by structure and timeline. The roadmapping definition emphasizes that roadmapping as a process does not necessarily lead to the creation of roadmaps, but is rather the application of the underlying roadmap framework to organize data, information and knowledge within a coherent structure. The principles underpinning these definitions are illustrated schematically in Fig. 1, with an example roadmap presented in Fig. 2 for space exploration.

Roadmapping is a very flexible approach, capable of being customized to fit a wide variety of strategic contexts due to its scalable architecture (Phaal et al.,

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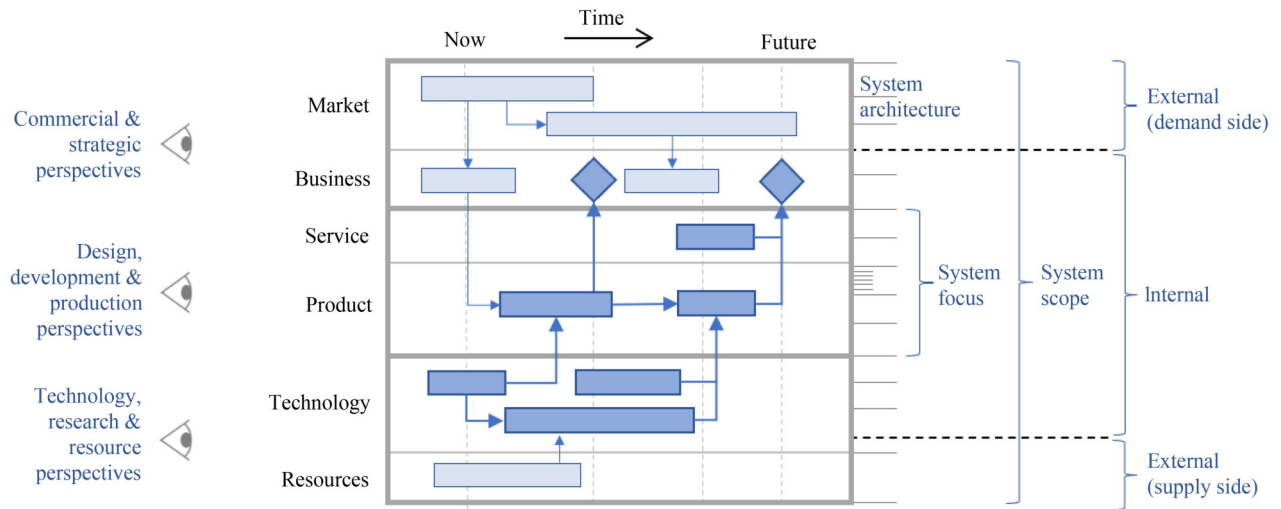


Fig. 1 Roadmap as dynamic systems framework and knowledge integrator (Phaal and Muller, 2009).

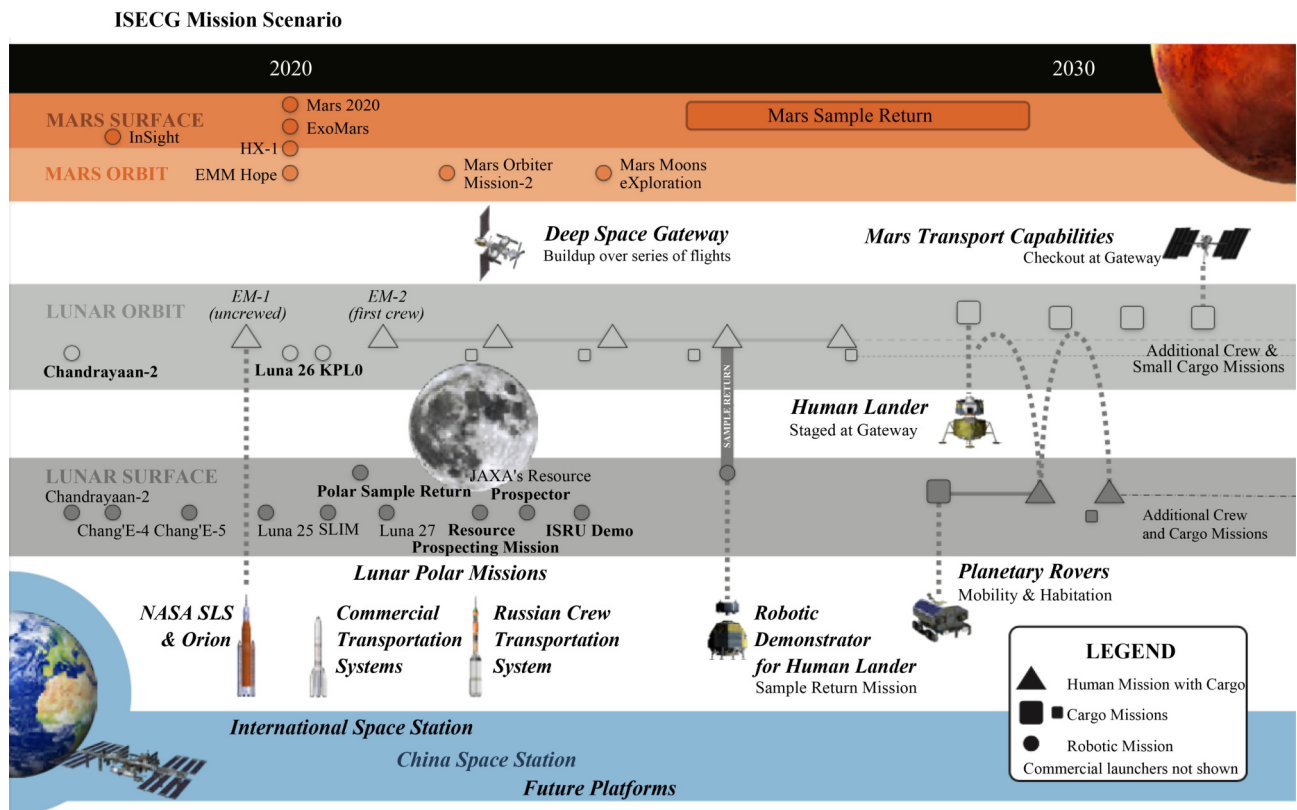


Fig. 2 Example roadmap from the International Space Exploration Coordination Group (ISECG) for a mission scenario (NASA, 2018).

2004; Lee and Park, 2005). As illustrated in Fig. 1, the system scope is represented by the overall ‘canvas’, in terms of relevant timeframes and system structure, which can be adapted to different levels of granularity, with higher resolution for the system focus of interest. This defines a family of hierarchical knowledge taxonomies, aligned with relevant stakeholder perspectives. The application focus is often included as a prefix to the roadmap term to convey this - for example, the method is often

referred to as ‘technology roadmapping’ due to its origins in high tech sectors. Similarly, product roadmaps focus on product innovation and strategy, and service roadmaps focus on services and associated business models. The roadmap scope in both cases encompasses other relevant parts of the system, including demand and supply side perspectives, represented as layers and sub-layers in the roadmap structure. The focus of this paper is the novel application of roadmapping to business processes and

systems, and roadmapping in particular, and thus is termed ‘roadmapping roadmapping’ or ‘R2’.

Despite its proven industrial track record and capability to support complex systems transitions, widespread adoption of the roadmapping method is hampered by:

1) A lack of awareness of the method in management and business generally, with the approach largely ignored in business school research or teaching (Phaal, 2024b), and thus not a standard method in business toolkits. For example, a Boston Consulting Group book (Reeves et al., 2015) describes a proliferation of strategy tools since the 1970s but did not identify roadmapping in their set of more than 80 tools. This myopia relating to roadmapping is attributed to its association with technology, despite its wider applicability to innovation and strategy.

2) While simple in principle, roadmapping is notoriously challenging to deploy systematically and sustainably at scale in organizations (Phaal et al., 2003; Cosner et al., 2007). Implementation success factors identified by de Laat and McKibbin (2003) are common to many strategic change programs: clarity of purpose, committed leadership, direct links to investment decisions, supportive culture, flexibility and adaptation, appropriate resourcing, review, and improvement.

This paper contributes to roadmapping implementation, the second challenge identified above, presenting a new approach to support strategic planning for roadmapping systems. Implementation aspects of roadmapping have been under-researched, highlighted as areas for attention in several recent literature reviews (Vinayavekhin et al., 2023; Chakraborty et al., 2022; Ding and Ferràs Hernández, 2023). The proposed method is aligned with research that has been published in this area by Gerdtsri et al. (2009), who provided a change management framework to support roadmap implementation, which has been incorporated into a roadmapping maturity model by Hirose et al. (2020).

A novel aspect of the proposed approach is to apply roadmapping to the challenge of developing strategic plans for roadmapping systems in organizations. This demonstrates the flexibility of roadmapping through the application of roadmapping principles to roadmapping itself, as a business process and system. The focus is on the development and testing of a workshop template to support organizations to discuss, clarify and agree how roadmapping can be implemented and should evolve as a system, managed as a dynamic capability (Teece et al., 1997; Penrose, 2009). Roadmapping is a structured prospective approach that enables resources to be aligned with demand to support strategic planning. The R2 template-based workshop approach is efficient and agile, enabling strategic plans to be adapted to circumstances change (Araújo et al., 2022). This is particularly important in the context of fast-paced digital transformation, requiring “semi-continuous adaptation of increasingly digitalized strategy, aligned with (changing)

environment and (flexible) overall business objectives” (Ellström et al., 2022).

The ‘Roadmapping Roadmapping’ (R2) template is presented in this paper (Section 2), together with its conceptual foundations, development, testing (Section 3), and application, illustrated with a case example from the additive manufacturing sector (Section 4). The outputs and benefits of the approach are clearer, coherent and consensus-based strategic plans for implementing roadmapping systems within organizations.

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## 2 Roadmapping Roadmapping (R2) template

The general form of the roadmapping framework is shown in Fig. 3, with the structure of the 3x3 grid governed by six fundamental strategic questions (Phaal and Muller, 2009), which enables customization (Phaal et al., 2004; Lee and Park, 2005):

- Where do we want to go? Where are we now? How can we get there? (i.e., When?)
- Why do we need to act? What should we do? How can we do it?

These fundamental questions are not new, as indicated by the following stanza from Rudyard Kipling’s ‘I keep six honest serving men’ poem of 1902, cited by (Kerr et al., 2013a), and are often incorporated into strategy frameworks and tools in one way or another:

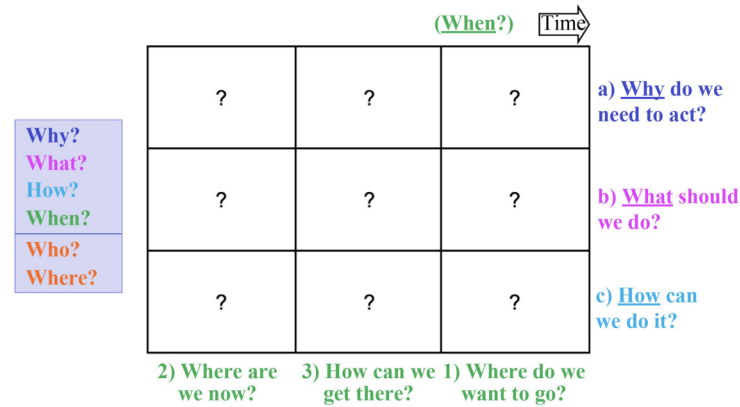
*“I keep six honest serving-men  
(They taught me all I knew);  
Their names are What and Why and When  
And How and Where and Who.”*

The Kipling Society (2024) suggests that the original inspiration is a 14th century medieval Latin epigram in the Register of Daniel Rough, Clerk of Romney (Kent, England):

*“Si sapiens fore vis sex servus qui tibi mando  
Quid dicas et ubi, de quo, cur, quomodo, quando.”  
(If you wish to be wise I commend to you six servants,  
Ask what, where, about what, why, how, when.)*

In roadmapping terms, the focus is typically on innovation, with the ‘Why’ representing trends, drivers, needs, and benefits; the ‘What’ representing product/service functionality and performance; and the ‘How’ representing technology, resources, and other enablers. The ‘Who’ and ‘Where’ relate to the structure of the roadmap (for example, the layers of roadmaps typically represent innovation system stakeholder perspectives), and these aspects are embedded in the content of roadmaps. The critical ‘When’ relates to the explicit dimension of time in roadmaps, in contrast to many other strategy frameworks and tools where time is an implicit variable (SWOT, for example).

The generic form of the roadmap framework is very flexible, enabling it to be applied to non-traditional topics with relative ease, including business systems, processes,



**Fig. 3** General form of roadmap framework, highlighting fundamental strategic questions that structure roadmaps as knowledge integrators.

and management tools, providing a structured framework to support strategic planning for these entities. As a workshop template, such roadmap structures can help to organize dialog, captured on the template using sticky notes, as a basis for learning, consensus-building, decision making and action. The outputs can be developed into visual roadmaps for communicating strategic plans more widely (Kerr and Phaal, 2015), supporting strategic alignment and deployment in the organization, focusing on the processes and systems that support innovation and other organizational goals, leading to agreed and aligned actions.

The general roadmapping framework shown in Fig. 3 was used to design the R2 template (Phaal, 2024a) shown in Fig. 4, which focuses on roadmapping as a process and system itself (see Table 1 for detailed template process prompts). This may seem recursive (it is), and confusing (it can be), but has been demonstrated to be efficient and effective in practice, and to work well as a means for helping organizations to ensure they are ‘on the same page’ with regards to roadmapping. Roadmapping can be used in many ways, and often stakeholders have different expectations and experiences of the technique, which hinder implementation if not understood and aligned. The use of recursive concepts to deal the many interpretations of strategy is not new – for example, the book *Your strategy needs a strategy* (Reeves et al., 2015).

The template shown in Fig. 4 includes the following features:

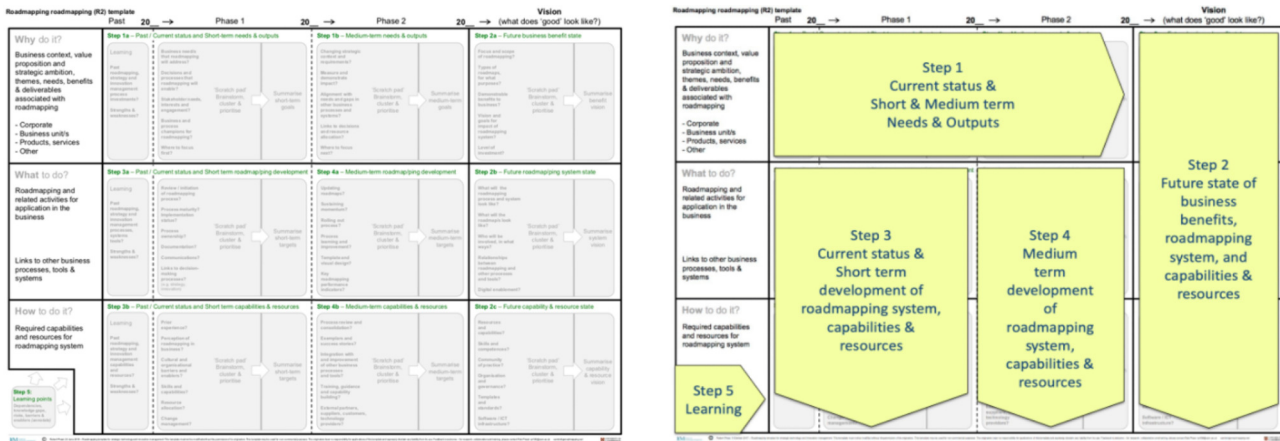
*Process steps*, which represent the steps participants generally follow when using the template. The template provides a canvas for guiding dialog and capturing and organizing perspectives, using sticky notes, and so is ‘self-documenting’. It provides visual and content-based guidance via a ‘reference’ process (sequence of non-prescriptive steps and prompts). Participants are empowered to communicate their views through the very flexible and simple technology of repositionable paper sticky notes and pens. For digital and distributed application of such

workshop methods digital whiteboards can be used to good effect (Oliveira et al., 2023).

The reference process is provided for clarity and simplicity; it is not intended to be prescriptive, and can be challenged and adapted as appropriate, allowing for flexible application. For example, although the first step focuses on understanding the motivation for roadmapping, quite often groups choose to focus on the future state first (Step 2), to establish ‘what good looks like’, which is fine. Sometimes it is appropriate to start with a critique of the current roadmapping system (Step 3). Participants can capture thoughts anywhere on the template canvas, to feed into the discussion. If in doubt, participants typically fall back to the reference process sequence, and/or seek assistance from a facilitator. In the end, the ‘pieces of the jigsaw’ must be organized into a synthesized strategic narrative as an output, as a step in a learning process, with questions, knowledge gaps and uncertainties highlighted.

As a visual method, it is relatively easy for one facilitator (or a small team) to cover multiple groups, empowering participants to organize their own discussion using this type of ‘self-facilitating’ template incorporating process prompts, freeing up the facilitator to focus on more strategic tasks. Groups where sticky note production slows and discussion falters can be quickly spotted, indicating that facilitation support is required.

*Process guidance*, in terms of content prompts in light gray text (see Fig. 4 and Table 1), highlighting aspects to consider during discussion, which may (or may not) be important for the context. This is key to avoiding the ‘recursive trap’ of starting to focus on the content of the organization’s actual roadmaps. For example, how an innovation might lead to increased market share and profit, rather than the roadmap of their organization’s roadmapping system to enable that goal (for example, deployment of software to support the roadmapping initiative as it develops). Since process prompts can be covered by sticky notes, a separate handout of the



**Fig. 4** Roadmapping Roadmapping (R2) workshop template, overlaid with reference process steps (green text in template); see for process prompts (light gray text in template).

**Table 1** Roadmapping Roadmapping (R2) template process prompts

<b>When?</b>	<b>Past</b>	<b>Phase 1 (date)</b>	<b>Phase 2 (date)</b>	<b>Vision</b>
	Learning	Short-term needs and outputs	Medium-term needs and outputs	Long-term needs and outputs ('what does good look like?')
<b>Why do it?</b> Business context, value proposition and strategic ambition, themes, needs, benefits & deliverables associated with roadmapping Corporate; Business units; Products and services; Other	Past roadmapping, strategy and innovation management process investment? Strengths and weaknesses?	Business needs that roadmapping will address? Decisions and processes that roadmapping will enable? Stakeholder needs, interest and engagement? Where to focus first?	Changing strategic context and requirements? Measure and demonstrate impact? Alignment with needs and gaps in other business processes and systems? Where to focus next?	Focus and scope of roadmapping? Types of roadmaps for what purposes? Demonstrate benefits to business? Vision and goals for impact of roadmapping system? Level of investment?
<b>What to do?</b> Roadmapping and related activities for application in the business Links to other business processes, tools and systems	Past roadmapping, strategy and innovation management processes, systems and tools? Strengths and weaknesses?	Review / initiation of roadmapping process? Process maturity? Implementation status? Process ownership? Documentation? Communications? Links to decision-making processes? (e.g. strategy, innovation)	Updating roadmaps? Sustaining momentum? Process learning and improvement? Template and visual design? Key roadmapping performance indicators?	What will the roadmapping process and system look like? What will the roadmaps look like? Who will be involved in what ways? Relationships between roadmapping and other processes and tools? Digital enablement?
<b>How to do it?</b> Required capabilities and resources for roadmapping system	Past roadmapping, strategy and innovation management capabilities and resources? Strengths and weaknesses?	Prior experience? Perception of roadmapping in business? Culture and organizational barriers and enablers? Skills and capabilities? Change management?	Process review and consolidation? Exemplars and success stories? Integration with and improvement of other business processes and tools? Training, guidance and capability building? External partners, suppliers, customers, technology providers?	Resources and capabilities? Skills and competences? Community of practice? Organization and governance? Templates and standards? Software / ICT infrastructure?

template is provided to participants to help avoid this problem, which also requires some vigilance and support from the facilitator. Again, these features of the template can be challenged and adapted as appropriate (for example, as has been done for policy and sector specific level applications, together with other business processes and systems, using the reference template as a starting point).

This template is a ‘meta- roadmap’ framework, or as one workshop participant from Case C in the next section described it: “building a roadmap is like building a wooden cabinet, while this process is about building the tools to build the cabinet.” In addition to text-based

prompts, other cues are provided to support the process and dialog, such as the ‘scratch pad’ concept, where within each cell of the template there is space for ‘rough work’ (if necessary), capturing, organizing, and prioritizing thoughts, before summarizing these to the right. Summarizing the results of each step in this way helps to bring clarity to the strategic narrative during communication and feedback of group work, while retaining detailed information for subsequent reporting and action – for example, the synthesis of several R2 template outputs into one consolidated strategic plan for roadmapping within the organization.

The template is designed for small workshop groups of about four participants, although smaller or larger groups are possible. With larger groups some active facilitation is required, although this can be light touch, and is a task often allocated to the person who will be feeding back the results of the activity during a subsequent plenary discussion. This is based on prior experience with such a roadmapping templates in workshops (Phaal et al., 2007, Phaal et al., 2018), confirmed in this study. For personal use the template is helpful for self-reflection and review, often as a first step of a process before involving colleagues.

For the facilitator of the workshop process the template is a useful diagnostic, capturing stakeholder perspectives as part of an intervention process. The process is designed for rapid (agile / lean) use, taking about 90 min to complete, providing a first cut roadmap, as a basis for learning, decision making, and action. The roadmap can be revisited to support ongoing strategic planning and action and can be used as a resource for developing a communication roadmap to support implementation (Kerr and Phaal, 2015). Designing such templates, including their customization, is also useful for facilitators, as a test of process coherence, and to transfer process know-how to empower participants, who are encouraged to capture and share their perspectives using sticky notes, as a self-documenting process. It has been demonstrated that good template design can lead to step changes in workshop performance (Phaal et al., 2018).

### 3 Development and testing of the R2 template

The R2 template and workshop process module are

adaptations of established, proven and published roadmapping concepts and methods (for example, Phaal et al., 2007; Phaal and Muller, 2009; Kerr et al., 2013b; Phaal et al., 2018), with the novelty in this case being the application of roadmapping and workshop methods to a business process and system, namely roadmapping itself. Thus, it was possible to develop and demonstrate the approach through a modest set of action research case studies with confidence, leading to wider adoption of the approach, in this paper. The R2 template has been tested six times during its development using an action research methodology (Platts, 1993), to prove the concept and refine and stabilize the process prompts, and has been applied multiple times subsequently in various contexts.

The first three pilot tests were exploratory in nature, used at the end of in-company roadmapping training and review processes to consolidate thinking and to agree actions. The template functioned well but required numerous facilitator interventions relating to the recursive nature of the approach. Based on this experience three further ‘instrumented’ applications were undertaken to test and refine the template, including the provision of process prompts for two of them. A summary of case studies is provided in Table 2, with test results from the three instrumented case studies reported in Table 3.

Selection of cases was opportunistic, based on organizations perceiving a need for strategic planning for their roadmapping systems, coherent with the action research approach adopted. Needs-driven cases were identified in several ways: at the end of in-company roadmapping training there is a need to plan and agree the way forward; requests for independent review and improvement of company roadmapping systems; a need to consolidate roadmapping approaches during a merger; and promotion of the opportunity to pilot a new method on a research

**Table 2** Roadmapping Roadmapping (R2) template and cases

Case	Process prompts	Sector	Notes
Pilot 1	No	Energy utility	Training course
Pilot 2	No	Water services	Roadmap system review in conglomerate
Pilot 3	No	Aerospace (supplier)	Training course
Case A	No	Electronics (defense)	Third party facilitator
Case B	Yes	Policy (energy)	Third party facilitator
Case C	Yes	Precision engineering	Roadmapping system review during corporate merger

**Table 3** Roadmapping Roadmapping (R2) template average test results (5-point Likert scale)

Case	Participants	Degree of completeness	Consistency of output	Quality of output	Ease of use	Overall utility
A	5	3.0	3.6	3.8	4.2	3.7
B	8	3.9	3.9	3.9	3.3	3.8
C	51	3.5	3.6	3.7	3.6	3.6
Benchmark <sup>a)</sup>	20	3.6	3.6	3.6	4.2	3.8

a) Reference process (Phaal et al., 2018)

basis. As a set of cases, variation was important to gain confidence on the general application of the approach (different companies, sizes, sectors and contexts). Participants in the case study workshops were selected by the participating companies, relevant to their context and purpose, with all including both technical and commercial functional representation, and a range of seniority.

The focus of this paper is on the process of roadmapping (i.e. “application of a temporal-spatial structured strategic lens” definition above), in a multidisciplinary workshop format, and the associated knowledge sharing and consensus building benefits. The outcomes are collective understanding, along with decisions and actions to move forward. This does not require an actual roadmap to be developed, which was a task that collaborating firms could undertake post-workshop to support wider communication and strategic planning. Utility of the approach is assessed on this basis, via process metrics and feedback from workshop participants (Platts, 1993), rather than assessment of roadmap artifacts, which is beyond the scope of the research reported in this paper.

Instrumentation involved gathering feedback from workshop participants at the end of the workshop process on a one-page feedback sheet. Four criteria were assessed, using a 5-point Likert scale, together with an opportunity to add specific comments on the template and associated process. The criteria were as follows, based on the template test described by Phaal et al. (2018), which provides a benchmark for comparing the R2 template utility. The results in Table 3 demonstrate that the performance of the R2 template is commensurate with the benchmark template for all four measures, and it has been used successfully on multiple occasions subsequently, including customizations for policy, innovation, and technology strategy contexts: 1) *Degree of completeness*: coverage of the topic in terms of depth and breadth; 2) *Consistency of output*: clarity and coherence of content; 3) *Quality of output*: defined as ‘strategically helpful’ in terms of understanding and decision making; and 4) *Ease of use*: how intuitive it was to use without external support.

This kind of semiquantitative process-based assessment is coherent with the action research method proposed by Platts (1993), as the most appropriate way to assess performance for such process-based management tool development interventions, to assure feasibility, usability and utility for wider deployment. This was demonstrated for the R2 template and workshop process through subsequent third-party applications in a range of contexts, including the case study in Section 4. No statistical significance is claimed for the results presented in Table 3 with scores and participant feedback used to provide an indication of performance for template and process improvement. Experience has shown that an average of around 4 (out of 5 in Likert scale) is a good benchmark to aim for in participant feedback for such

processes, in terms of providing confidence that the method is fit for purpose and ready for wider application. Similar approaches are commonly used during consulting-based workshop applications and training, for quality assurance and improvement.

Case C (see Tables 2 and 3) was particularly interesting, given its scale and context, occurring during the merger of two large companies operating in the scientific instruments sector. Each had developed its own technology roadmapping process in the past, and there was a desire to learn from the good practices in each and co-create a new roadmapping system for the future integrated company. The R2 template test was conducted as part of a three-day meeting of senior technologists and managers, considering various alignment aspects of the merger (for example, synergies, duplication, and common platforms).

The R2 template test involved 10 groups, each comprising 4–7 participants, including representatives from both companies – see Fig. 5 for a photograph of one of the groups in action. Following a 90-min roadmapping training seminar, and brief instructions (10 min), groups worked for 90 min using the template, followed by feedback from two selected (contrasting) groups, and general discussion to identify key learning points and actions (45 min). Two facilitators were available, with some support required during the workshop, where it was observed that ‘sticky note production’ slowed down (typically indicating that a group had hit a problem), on request (to clarify a particular process or content point), and in one case to resolve the ‘recursive problem’ noted above.

In addition to rating the utility of the template, participants had the opportunity to provide comments on the process, which were clustered into four themes – see Fig. 6, including illustrative quotes. Testing of the R2 template highlighted the following learning points:

*Communication* was highlighted as a key benefit, without any negative comments received in this regard, in line



Fig. 5 Roadmapping roadmapping (R2) template test, Case C.

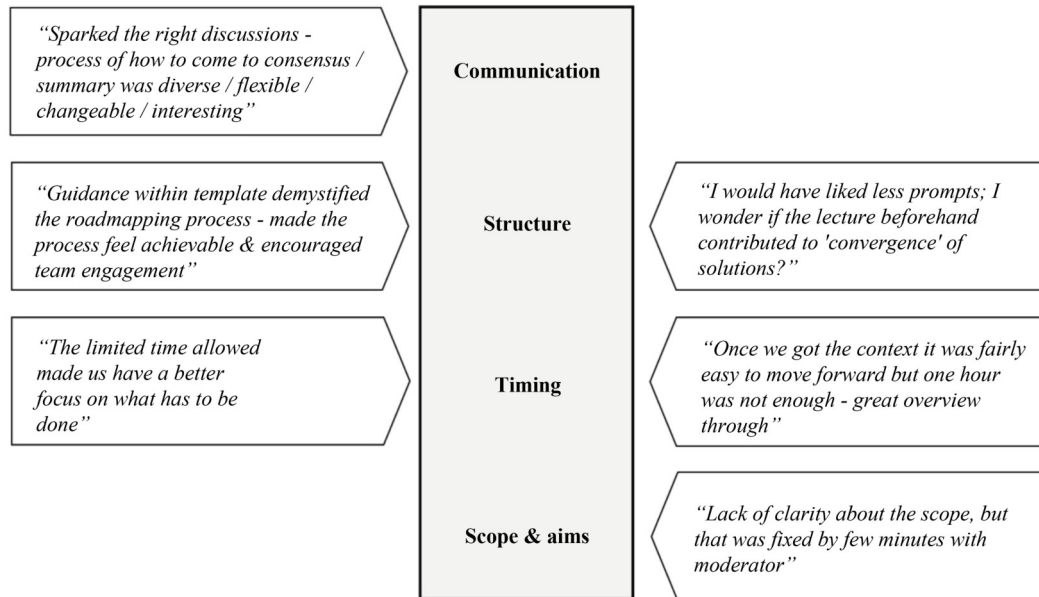


Fig. 6 Representative participant comments received, Case C.

with general experience with roadmapping as a consensus-building process, often involving cross-functional workshops. Building consensus is important and beneficial but comes with the potential dangers of narrow groupthink (de Laat and McKibbin, 2003), and steps should be taken to counter this. For example, external stakeholder views can be sought, assumptions articulated and challenges, and sensitivity analysis. Motorola, which was influential in the uptake of roadmapping in the 1980s, required a consensus-building approach, balanced by a 'minority report' (Williard and McClees, 1987).

*Structure* provided by template process guidance and prompts received mixed reviews – although generally appreciated, for some they were a distraction, appearing complex or constraining. Strategy is complex, and this is reflected in the content of the roadmaps, and the prompts provided. These are included in the template in light gray, as they are not intended to be intrusive or prescriptive. There is a tradeoff to consider when designing templates, as to how much structure and how many prompts to provide – however subtle these are, they will both guide and constrain thinking (Phaal et al., 2018).

*Timing* was perceived as a challenge, with only 90 min generally scheduled for the process. However, this pace is not untypical of similar roadmapping workshop processes (for example, benchmark case in Table 3), and there were mixed opinions in the feedback – some participants appreciating the benefits of the pace in terms of focus and efficiency. Further briefing/training is required for participants that are not familiar with the roadmapping approach. There are benefits and drawbacks to speed. In general, a rapid initial iteration is advised, as a learning process, increasing agility, improving efficiency, reducing risk, and managing expectations of participants.

*Clarity of scope and purpose* was an area where only negative comments were received, in terms of both the activity and the corporate strategy and vision, which are related. The need to be clear about focus and scope is important for all roadmapping (and strategy in general). As a diagnostic, the first iteration of a roadmapping process is likely to reveal both good and bad, and it is useful as a diagnostic for this reason. Defining and agreeing scope and focus is a challenging first step in many roadmapping processes (and strategy more generally), but vital for progress, and a benefit of the approach. For Case C the merger context of the application was challenging, with the workshop taking place during a transitional period where the overall corporate structure and strategy were in flux. The method was used as part of that process, to ensure technological aspects were considered at a strategic level to enable effective integration of the two firms.

The results from this and other test cases were used to refine the template and build confidence in its use. Capturing participant feedback is good practice and allows for continuous learning and improvement. 'Vanilla' general-purpose templates and reference processes such as that reported in this paper can be a useful starting point, although templates can and should be customized to purpose where appropriate.

#### 4 Industrial application – Star rapid experience

Star Rapid is a UK-owned multinational company with over 250 employees, headquartered in Zhongshan, China. Founded in 2005, Star Rapid specializes in rapid proto-

typing, rapid tooling and low-volume manufacturing using a variety of advanced manufacturing processes, including 3D metal printing, multi-axis CNC machining and plastic injection molding, and is fully certified to ISO9001, ISO14001 and BS-OHSAS 18001 standards.

Experiencing rapid growth, Star Rapid wanted to find an innovative approach to strategy that would drive consensus inside their culturally diverse organization and improve planning and coordination. Star Rapid was facing several challenges relating to its fast growth: Prioritizing business objectives; Emergence of organizational silos; Increasing difficulty in ensuring cultural alignment throughout the organization as headcount grew; and Language and cultural barriers between western experts and Chinese colleagues.

The R2 approach (Fig. 7) was initially applied with the President and the CEO of Star Rapid in 2017, and later revisited and iterated throughout implementation. The effectiveness of the approach was assessed by reviewing the implementation results after an eight-month period.

Prior to holding the R2 workshop, outputs from a prioritization survey administered to the management team were analyzed to determine how roadmapping could be applied, enabling prioritization. Following analysis of the survey, a milestone themed topic roadmap was created outlining the business aims from 2017 until 2021.

The prompts and questions on the R2 template helped Star Rapid look at roadmapping dynamically and facilitated a systematic and structured discussion. The steps and questions acted as a checklist, allowing for consideration of many variables. While not all prompted questions were answered during the initial R2 activity, the questions were later revisited and considered. The output of the R2 activity was a highly detailed project plan with milestones. The value of the R2 activity played a significant role in forming the understanding in how to properly phase implementation.

The R2 process helped Star Rapid to clarify the reasons that motivated it to implement roadmapping: 1) Establish

a structured strategic planning process that integrated all levels of the organization at regular intervals; 2) Increase clarity of the company's strategy and direction, capture more perspectives, and reduce information asymmetry; 3) Improve prioritization of organizational projects and overall resource management; 4) By adapting the social processes of roadmapping, drive positive and productive behavior within the firm and increase overall employee engagement; 5) Set sound strategic objectives by systematically analyzing the state of customer needs, regularly assess emerging technologies, and get a full understanding for the external environment; and 6) Develop continuous improvement/kaizen methodologies utilizing a robust process that was more effective and able to overcome language barriers.

The vision for roadmapping in Star Rapid called for company-wide deployment, tying people and systems together under one common approach for collaboration, coordination, and execution. By 2021 the aim was to have had multiple iterations and a well-defined roadmapping system for strategy, innovation, and organizational project management at every level of the company, from the shop floor to senior management. This would be managed by a roadmapping team, consisting of multiple champions. Each functional area of the business would have its own strategic roadmap with a common form of communication.

Development and implementation of the roadmapping system involved coordinating activities with the middle and upper management across every department of the company, with a strong emphasis on stakeholder engagement. It was also important to consider which employees were neutral and favorably viewed, and therefore be able to facilitate the testing and deployment of the tools with the different teams, both in departmental and cross-functional settings, with the goal of gaining support for the approach. The aim was to utilize topic roadmapping as a primary tool to address practical everyday problems, applied to different contexts which the organization

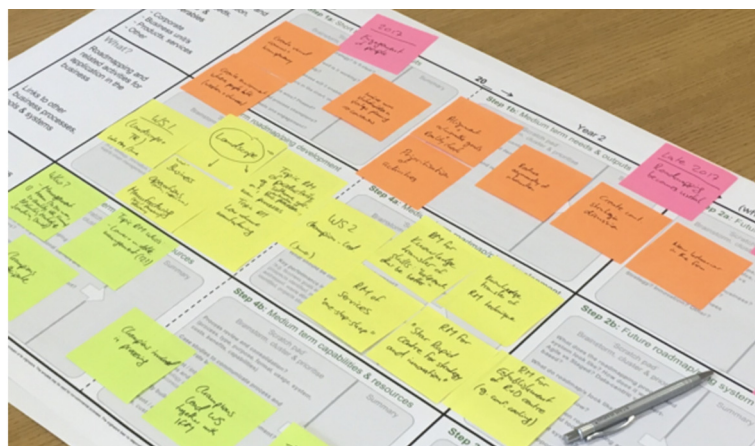


Fig. 7 Use of R2 template in Star Rapid.

faced, and create a cascading effect to encourage universal application of the approach, while simultaneously building up baseline roadmapping knowledge in advance of the more advanced business landscaping activity.

Star Rapid planned to implement strategic roadmapping and business strategy tools in the organization over an 8-month period. The CEO budgeted approximately 8 h each week to develop and deploy the system. This structured commitment of time and systematic approach was crucial because there is a need for discipline and consistency when training others, staying organized and getting feedback. No time is wasted as roadmapping neatly intertwines with routines.

During the topic roadmapping exercises, the middle and upper management team developed their skills in facilitation, creating an environment that resulted in better coordinated meetings, higher quantity ideas and a deeper understanding of how to explain the prompts and underlying roadmapping structure.

Practicing roadmap synthesis was very helpful because learning how to cluster, converge, and sequence is important to be able to use the roadmap for not only communicating to a larger audience and gathering perspectives from other non-participating stakeholders, but to also improve the setting of objectives and designing critical paths during project planning.

After a pause of two years, and a management reorganization, Star Rapid decided to continue deploying roadmapping in 2021 as an effective way to improve cross-functional collaboration and continuously update strategy. As part of this initiative, the R2 template was used again, to review and improve their roadmapping process, and to ensure alignment with current business needs, context, and aspirations.

A strategic landscaping workshop identified 30 themes, prioritizing eight for further exploration after a group voting activity by senior management. Star Rapid then held topic roadmapping workshops with cross-functional teams and subject matter experts to explore and clarify strategic priorities. The benefit of this approach resulted in the elimination of low value-add projects, increased commitment from stakeholders, and improved resource allocation.

The R2 process enabled broad alignment between functions to commit to developing a strategic planning process and sustaining it. Feedback scores ( $n = 3$ ) for ease of use, degree of completeness, consistency of output, and quality of output (see Table 3) averaged 4.0, 4.3, 4.6, and 4.0, respectively. The CEO continues to support roadmapping and the continuous development of strategy, commenting: “It is an extremely helpful and insightful process. A very quick way of getting to what’s important in the future development of the company.”

There is broad agreement that using guiding visual and social processes to engage the entire organization and combine the best ideas will help Star Rapid find the best

way forward.

## 5 Conclusions

The research described in this paper contributes to both practice and theory. Contributions to practice focus on the development and testing of a roadmapping workshop template and process to support organizations to develop coherent strategic plans for their roadmapping systems. This represents a novel application of roadmapping to management processes and systems, reflecting flexibility of the method. Utility of the approach has been demonstrated through six case studies, as being efficient (90-min small group activity), and effective in terms of producing a consensus-based actionable way forward. The approach has subsequently been applied multiple times in a variety of contexts business contexts, including the Star Rapid case study presented in Section 4, demonstrating utility of the R2 approach, enabled by its ‘self-facilitating’ template design, incorporating embedded process prompts (Phaal et al., 2007).

Contributions to theory relate to strategic planning, which is recognized as an important dynamic capability (Teece et al., 1997) within the resource-based theory of the firm (Penrose, 2009). This is particularly important in the volatile, uncertain, complex and ambiguous (Bennis and Nanus, 1985) contexts that characterize the modern world, with strategic planning aiming to support the “seizing and continuous alignment of assets and resources” (Araújo et al., 2022). The rapid cycle time of the template-based workshop approach developed is agile in nature, enabling strategic plans to be adapted as circumstances change, with ‘strategic learning and change’ the dominant cluster identified in the bibliographic network analysis of Vogel and Güttel (2013).

Limitations of the research relate to the rather small scale of the study (six trials in total) and subjective nature of the participant feedback to assess utility of the approach. Case studies represented a variety of contexts and participant feedback is an established method for assessing process utility for development (Platts, 1993) and quality assurance. However, further testing would be beneficial, and a larger set of case studies in a wider variety of contexts would enable more robust analysis and statistically significant results.

To address these limitations and extend the research, future research opportunities include: 1) Further testing of R2 template and process in diverse organizational contexts, comparisons with alternative methods, and in longitudinal case studies to assess the impact of the approach, and for the implementation pathways for roadmapping systems to be better understood; 2) The use of roadmapping to support strategic planning for other business processes and systems, beyond roadmapping itself, such as innovation and supply chain management;

3) The broader challenge of how to support organizations to implement sustainable roadmapping systems at scale, considering culture, politics, and change management; information structure and complexity; and digital support (for example, virtual and augmented reality, and artificial intelligence); and 4) The application of roadmapping to the field of roadmapping overall (as opposed to the firm level application described in this paper), retrospectively and prospectively.

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