MOTT MACDONALD

Moving from base camp to mountain peak:

Innovating in the built environment

A white paper exploring how the infrastructure sector can take innovation to new heights

Executive summary

The infrastructure underpinning how we live – including our energy, transport, and water systems – is key to thriving communities and a healthy planet. Innovating in the infrastructure sector is essential if we are to achieve the outcomes that society, organisations and their customers need. These outcomes include sustainable development, resilient services, thriving communities, and better value for money – all of which are especially important as we respond to the challenges of delivering our net-zero commitments.

Social outcomes are a key driver for Mott MacDonald, so we have prepared this paper in collaboration with infrastructure owners and operators, regulators, innovators and suppliers in the energy, transport, and water sectors. We want to share our findings, calling on business leaders, innovation professionals and policy makers to take the next steps forward with us and collaborate to achieve social outcomes. Pace and scale matter here – the timeline to deliver net-zero is short; system-wide innovation has the potential to increase our chances of delivering net-zero in a faster, better and cheaper way.

Research into asset owners and operators in the energy, transport, and water sectors has shown that each can innovate independently, with most in a position whereby strategies and processes are in place and ideas are being generated: this is what we call ‘base camp’. However, given that many of the challenges infrastructure faces are system-wide, reaching beyond organisations and across sectors, there is a limit to the amount of value that can be achieved at an organisational level.

This is evidenced by the results of the Smart Infrastructure Index whereby the majority of over 1000 respondents indicated that they struggle to see outcomes and benefits from innovation. Common challenges include physical legacies, an aversion to risk, non-competitive markets and the inability to implement and upscale due to cultural rejection, regulatory arrangements and contractual structures. It is now time to shift to a higher level, address complex challenges of management and organisational capability, and support the effective implementation of scalable innovations that will help us attain the highest peak.

To take innovation to new heights, we need to recognise that the built environment is a complex, interconnected system of systems serving society, and there is a clear opportunity to be collectively more ambitious to deliver better outcomes for society. Adopting a systems-based, outcome-focused approach (World Economic Forum, Infrastructure 4.0) is the best way for the industry as a whole to take innovation to new heights. Digital technology can be a key enabler for this approach, and quality data can help the industry to achieve innovation benefits at pace and scale.

In this paper we highlight four key recommendations to successfully do this:

1. Be outcomes-focused

2. Transform the core

3. Build, measure, learn

4. Collaborate across the ecosystem

Whilst these recommendations may apply at the organisational level, there are cross-cutting trends that all sectors need to overcome and adopt as one, with regulators being a key stimulator. We refer to these trends as co-opetition over competition, better over more, and systems over silos.

As well as doing things together, sectors can adopt and learn from one another to understand the direction of travel and effort needed. For example, in the transport sector the vast amount of open data has led to a higher level of interest from investors. In the water sector we see greater collaboration and leadership, with a culture of sharing that could be adopted in other sectors. In the energy sector, the focus on net-zero has helped drive improved leadership, venture capital interest, collaboration and access to more open shared data. We should not underestimate the challenge of achieving this collaboration – it will need a real cross-departmental, cross-sector focus from government, regulators and the industries involved.

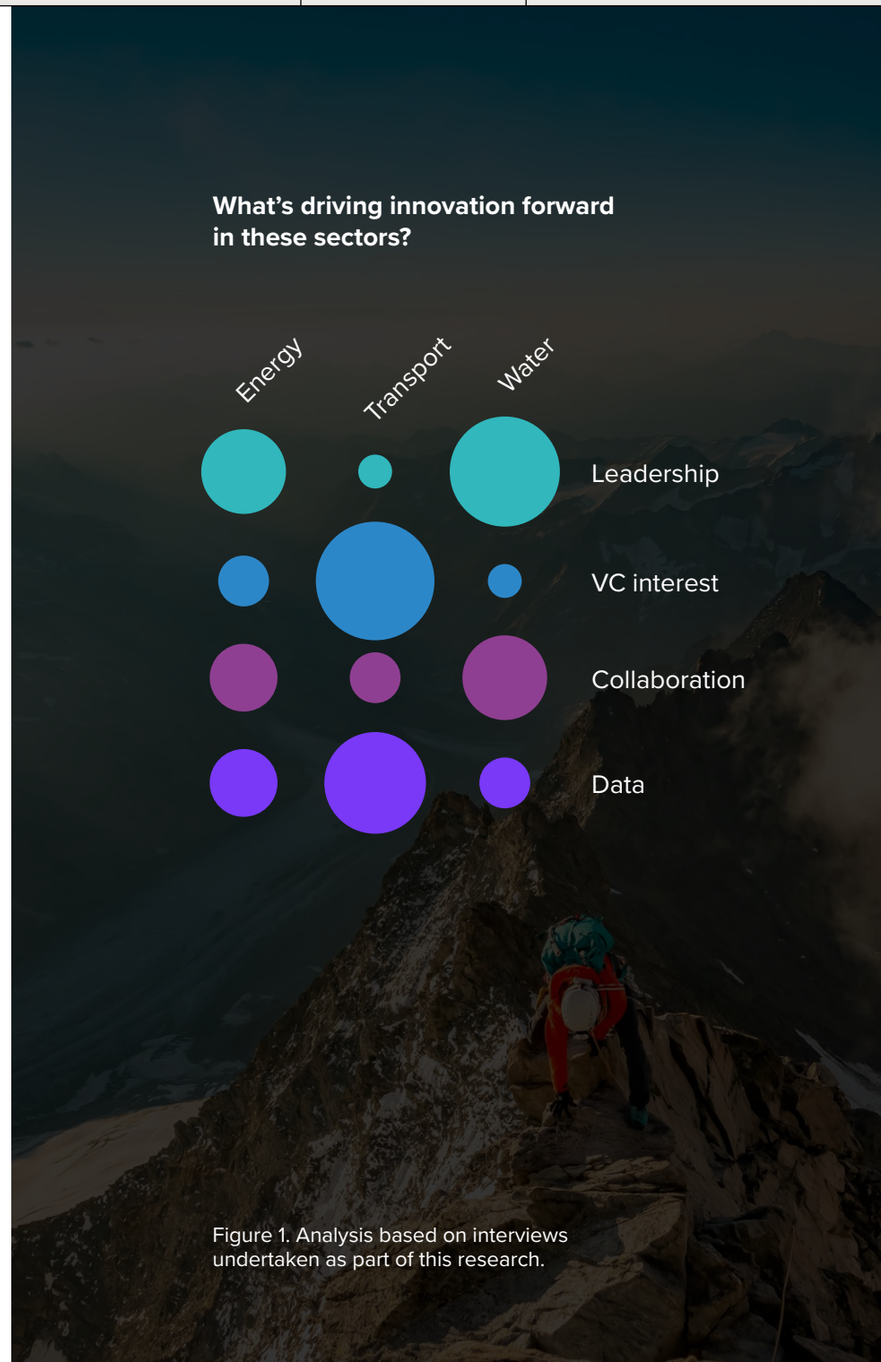


Figure 1. Analysis based on interviews undertaken as part of this research.

Preface

Only a systems-based, outcome-focused approach to innovation with technology as a key enabler will help us to achieve benefits at pace and scale.

Earlier this year, the UK government launched a strategy outlining key actions across four pillars to make the UK a global hub for innovation by 2035 (**UK innovation strategy: Leading the future by creating it**).

In the infrastructure sector, there is a connection between innovation and delivering social outcomes. That's why innovation is at the heart of the UK's National Infrastructure Strategy, and is a core part of the UK's plans for future economic growth (**Build back better: Our plan for growth**).

Meanwhile, the Centre for Digital Built Britain set out a vision which suggested the purpose of the wider built environment is to 'enable people and nature to flourish together for generations' (**CDBB, Our vision for the built environment).**

The transforming construction challenge invested £170M, matched by £250M from industry, in 2020-22 to bring together the entire infrastructure innovation ecosystem to deliver greater 'whole-life value' to society.

The infrastructure industry innovation partnership **(I3P**) has been working since 2016 to bring people together and create a network of innovators.

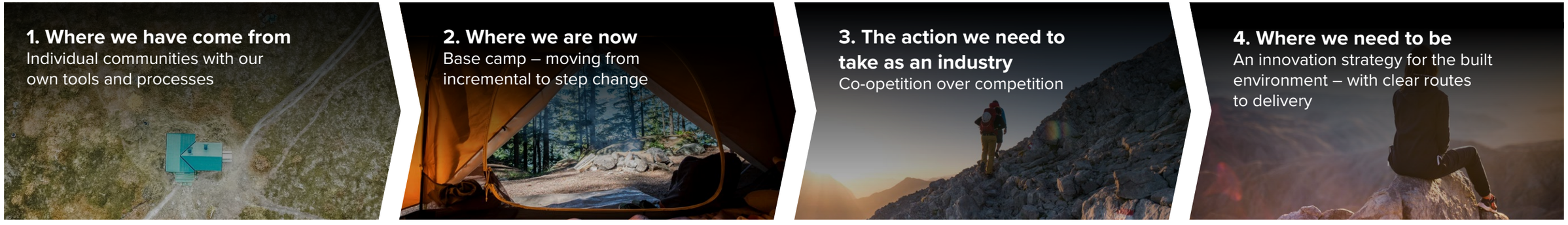
We are now seeing the formalisation of innovation management systems, supported by the British Standards Institution (BSI) who have launched a Kitemark scheme for the international standard for innovation management (ISO 56002).

This is a good start, but we must do even better.

In our discussion with i3P's William Redaway and others, it was agreed that the industry has reached base camp – we know innovation is important to reaping numerous benefits. It is now time to take our efforts to a higher level. We need to rise to the complex challenges of management and organisational capability, working as whole sectors and across sectors, to support the effective implementation of high quality, scalable innovation.

Getting to the top of the mountain at pace and scale will involve risk, trials, changes in behaviour, learning and listening to one another. We must continue this pursuit with grit: building, measuring and learning with an open mind.

Our direction of travel:



Energy sector insights

Nowhere has the drive towards net-zero been as dominant as in the energy sector. Sector engagement is well under way, and there is a real focus on upscaling innovation across energy transmission and distribution.

At the end-user level there are numerous market entrants bringing innovative products and services to market, although these can be stifled by regulatory and market structure constraints.

We have seen evidence of collaboration between regulators across sectors, with a clear aim of working towards net-zero through taking a systems-based approach.

Funding is available at regulatory, organisational and programme levels to support innovation in the network part of the sector. Organisations are not solely focused on financial returns, but are taking a holistic view of 'value' including customer experience and knowledge attainment.

The cultural aspects of innovation are well understood in the sector, with organisations recognising the benefits of embracing innovation to support employee satisfaction. There is also a willingness to embrace failures as learning opportunities rather than negative experiences.

Innovation management teams are in place to support organisations, bringing new concepts and tools to operational parts of their businesses.

Opportunities for collaboration and improvement

As in other sectors, there are societal benefits to be gained from managing and sharing data better. Frameworks and processes exist that can enable both commercial returns and customer value, but it takes an open mind to see how these can be achieved concurrently.

Similarly, management of intellectual property and risk when working with start-ups was identified as an area the sector needs to make progress in.

Both the sector and the government should consider ways to streamline funding routes and encourage collaboration over competition, with efficient processes and governance.

Realising the benefits at scale

The energy sector recognises the key role implemented innovation will have in realising the net-zero vision and is working hard to understand how to deploy change at such a scale.

"We can have great ideas and inventions, but they need to have impact to be innovative".
John Farrington, EDF R&D UK Centre

Continuing to quantify and understand where the different types of value sit within the ecosystem will be vital in demonstrating innovation that can succeed at scale and across sector boundaries.

Creating an inclusive culture across sectors with the wider ecosystem will support adoption of innovation across infrastructure.

Having open, cross-sector conversations about these topics will support opportunities to move the needle on progress towards net-zero, not just in the energy sector, but across infrastructure as a whole.

To support the sector we asked our innovation consultants:
How can the supply chain make the most of open data initiatives?

Organisations should update their data practices in line with the energy data best practice guidance.

Take any opportunities to be proactive in engaging with the regulator, for example, through the open data sandbox initiative.

Don't hold back from engaging in open data initiatives simply because of the perceived risk of public scrutiny.

Transport sector insights

The future of mobility and connectivity will be achieved by re-inventing contractual structures collaboratively, incentivising leadership throughout the organisation and being customer-focused and market-led for greater autonomy of movement.

Given the vast amounts of transport data available and the disruption that autonomous and electric vehicles will bring, there is no shortage of opportunity or ideas in the sector to enhance the way we travel.

The sector has a variety of manual step-by-step processes in place to support innovation, with a portfolio of ideas that mainly focus on 'Horizon 1' innovation (maintaining and defining the core business). The sector has the financial means and interest to invent, test and develop innovative solutions through these processes. We asked innovation professionals in the sector how their capabilities are developing, what their direction of travel is and what current challenges they are trying to solve.

Opportunities for collaboration and improvement

Within the sector, those we spoke to shared a willingness, intent and desire to innovate openly across the supply chain and with other industries. This is starting to happen, but legacy culture and ways of working are preventing the sector from moving at pace and scaling adoption, with participants stating that the average innovation takes eight years to implement.

The sector is committed to making the most of public funding and associated state boundaries. However, this often limits organisations' risk appetite and ability to have a mixed portfolio of projects. Complex ecosystems such as partnerships, frameworks and contractual structures are stunting scalability or restricting innovation to certain projects and programmes. The greatest challenges continue to be around people and culture, especially an aversion to risk or change, a lack of capacity to deliver and a 'command and control' attitude.

Success is in the hands of the people

The sector has an ambition that can be met through greater collaboration and management of innovation systems. To move at pace and improve adoption, the focus needs to shift from centralised R&D to enterprise-wide capability enhancement programmes. To use the analogy of climbing the mountain, the sector can reach the top by listening to the ideas of the many, bringing everyone on the journey, being agile, and following the build, measure, learn recommendation highlighted in this paper. There is a need to implement systems-thinking, and reinvent end-to-end delivery processes, not just add onto existing ones. We call this 'transforming the core'.

"We need to adopt a 'no ivory tower' approach to innovation and focus on putting the innovation and ideas in the hands of people on the ground."
Howard Mitchell, HS2

To support the sector we asked our innovation consultants:
What can transport organisations do to reduce the complexity of their innovation systems and contractual structures?

Have one enterprise-wide approach that's iterated and adjusted based on end-user project and programme feedback and KPIs.

Have designated points of contact to share knowledge, keep people accountable for innovation and provide ongoing feedback.

Assess the value of innovations with the supply chain – considering different types of value and incentives that contribute to social outcomes.

Undertake procurement and contract research to identify sector specific pain points and successes among other industries. (see: **Project 13**)

Water sector insights

Water challenges do not recognise organisational boundaries, so neither should the sector. A collaborative movement has started and it will take commitment, funding and variety to make a difference.

The higher frequency and visibility of flooding, ageing infrastructure and increased water demand has created an imperative for innovation that cannot be ignored, especially as we continue to see the effects of climate change on our water supply and management.

Ofwat's **innovation strategy**, published in January 2021, gives a good foundation to build on. Organisations within the sector have shown leadership by setting up their own initiatives, such as Innovate East, and are inviting people to attend innovation festivals. No longer are one-hour meetings the norm; instead legal 'deep-dives' and design 'sprints' are enabling organisations to see the value in a varied approach to delivering innovation – designing meetings around tasks rather than tasks around meetings.

Innovation is highly supported by leadership across the organisations that we spoke to. There was noticeable appreciation of the need to transform the core business of the sector, and of the role that HR and Communications can play in this. However, transformational innovation is rare, and there is a need to go further together, whilst managing risk averse and traditional R&D cultures and a complicated funding structure.

Opportunities for collaboration and improvement

With underground and legacy assets making it difficult for organisations to fully understand the challenges they face, a sector approach to open, shared and structured management of data will support innovation and collaboration at a higher level. There is a need for the regulator to consider ways to consolidate funding in order to facilitate greater collaboration and simplify the process of obtaining government grants. The sector is also the least likely to engage in the start-up community and academia, so it should consider broadening its ecosystem to deliver more transformational innovation.

Striving to create a movement

The water sector has the basics to make innovation a success, but to achieve outcomes like net-zero, innovation needs to be opened up more to other sectors, academia and the start-up community. The current frame of reference can be limited to utilities, but there are bigger opportunities around end-use, reducing and retiming demand that make collaborating with the building, manufacturing and other sectors essential. This will be the basis of a collaborative ecosystem and movement towards solving greater goals. Unlike other sectors, the water sector is not short of innovation leaders; what it needs is more followers to really see the benefits of innovations, to adopt them and to be open to change. You wouldn't want everyone to be a guide when climbing a mountain; while you need direction, you also need the confidence and trust that comes from other followers treading the same path.

"Keep Innovation teams light – we need followers more than we need leaders. Many leaders make for a talking shop, many followers make a movement."
Angela MacOscar, Northumbrian Water

For this to happen, people will need to be educated on the importance of innovation, and provided with the 'oxygen' to innovate.

To support the sector we asked our innovation consultants:
What can regulators do to incentivise shareholders to invest in innovation beyond regulatory cycles to support scalability?

Create shorter-term financial incentives for shareholders to invest in innovation.

Regulators could reward specific metrics around innovation, such as the number of innovation ideas per year, or the financial value of the investment committed to innovation.

This would mean that shareholders would see some rewards from this activity in the short to medium term, while allowing the organisation to invest in innovations which will deliver value over a longer time frame.

Recommendations

At Mott MacDonald, we believe that everyone has a role to play in achieving outcomes for the public good.

Based on this research, it is vital that the industry focuses on these four recommendations if we are to receive the benefits that come with implementing innovation at pace and scale.

1.

Be outcomes-focused

Innovation projects should be aiming towards the same vision and goals. Focus on outcomes achieved at the innovation programme and portfolio level, examining how they deliver value to your business and society – the whole is more important than the individual parts.

Outcomes are achieved through a variety of different means. If one innovation project is not successful, it does not mean it has not contributed to the success of another innovation and your knowledge bank.

Top tip: You can track successful innovations by measuring different types of outcomes. These measures include usage, effect on safety, knowledge, reputation and customer satisfaction.

2.

Transform the core

Innovation is not an add-on. Transforming what happens in the core operational business is necessary to enable benefits to be realised at scale.

Transforming the core is dependent on processes, people, and information. You need to understand the maturity of the affected organisational capabilities and how people and information interact with redefined processes that can support innovation to scale in a meaningful way.

Top tip: Start with process modelling and transformation by asking the question – what is our current process and what would have to change to implement this innovation? This will uncover opportunities to upskill, develop capability and address any existing and potential pain points.

3.

Build, measure, learn

Innovation is not linear, and should not follow a linear process. Agile principles and design thinking should be at its centre. Users need to be at the heart of decision-making to ensure that what is developed is meaningful and useful. A culture of continuous learning and iterative development is essential to being lean and efficient.

Top tip: Your innovation process should be informed by data and research at each and every stage of your innovation lifecycle – not just the beginning. As well as measuring the innovation based on user feedback, measure the management of innovation in relation to the BSI ISO 56000 innovation management standard.

4.

Collaborate across the ecosystem

Whatever it takes – make this happen, across functions, organisations and sectors. There is no such thing as a ‘digital only’ project and diversity of thought matters.

A broad range of stakeholders inside and outside of the organisation can be the difference between a failure and a success, because perspective contributes to a systems-thinking approach.

Top tip: Leadership should play the role of ‘setting the stage and letting others perform on it’. Focus on being really good at defining the problem and let the market own the solution so it can scale. Leadership should protect innovation by removing any legal, financial or political barriers that get in the way of effective communication and collaboration. These are complex challenges that will take multiple organisations to solve with a risk that no innovation will be achieved. Rather than trying to navigate these constructs, it is essential that innovation moves forward, creating new constructs that are not held back by traditional ways of working.

Trends on the horizon

These trends will help asset owners and operators when trying to innovate at pace and scale. They will also allow the supply chain to support asset owners and operators effectively.

Co-opetition over competition

Co-opetition is understood as traditionally competing companies forming a partnership that generates new net value for those involved.

Co-opetition requires a focus on alignment to generate value, creating win-win through partnerships.

It is importatant to start with clarity on the scope of the partnership and understanding of any shifts in control.

Organisations can then consider how to divide the value generated, shifting from a zero-sum game to one where the end result benefits the whole.

Organisations must understand technological integration, and how each organisation's commercial model will align.

Cultural and organisational flexibility challenges must be overcome to shift the prevailing view that there can only be competition or cooperation. There can be a 'compete and cooperate' mindset. This will take systems-thinking from multiple organisations to work together on complex challenges e.g. legal and political. It will take the full force of the industry to move forward.

Better over more

This is about being resourceful, efficient and focusing efforts.

Sectors are not short of ideas, but come up short when scaling and doing things at pace. It is essential that the focus turns from generating more ideas, to focusing on quality and the surrounding factors that make innovation successful.

Capability is a key part of this. Organisations should play to their strengths and partner with experts that help them move at pace and scale. Choose partners that offer learning and upskilling as part of a service to ensure internal teams make the most of the expertise.

When assessing digital technology and what is best for the business, organisations should define and adopt the agile mindset of 'good enough' – a culture change from engineering excellence. This is a particular challenge in regulation and policy, where agile techniques are not as well known. This will enable organisations to test innovations at pace. This mindset is particularly important when funding innovations using a 'build, buy, partner' approach. It's unlikely that a solution you buy or partner with will be excellent at the start, but taking the decision that it is 'good enough' will save time, money, increase knowledge and improve your ability to move at pace and scale.

Systems over silos

Taking a systems-based, outcome-focused approach to achieving societal outcomes removes the barriers of linear thinking.

The leap the industry needs to make is transformative. It will take radical change and a diversity of thought to meet desired outcomes, and to grow and change customer demand. The industry needs to be open to a difference of opinion, uncertainty and creativity from people and organisations across the supply chain and even further.

Within the built environment, assets need to be developed and legacy assets improved and maintained to suit a variety of different people's needs over a long lifespan. Systems-thinking looks at assets in a holistic way, considering the context and surrounding elements that affect the overall outcomes of the system.

Organisations will need to reassess how they look at the asset lifecycle when innovating, consider secondary factors, connections and a diverse range of thought for holistic reasoning and to achieve ultimate customer satisfaction. It is only by moving from linear to more systems-thinking that we will be able to implement and scale innovations successfully.

Meaningful innovation, managed.

Bring the best ideas to life as part of the everyday. From discovery to implementation, we provide the tools to make it happen.

Our advisory service dives deep to unblock organisational barriers, whilst our platform capability operationalises innovation to be effortless and inclusive.

Domain × Digital

At Mott MacDonald we drive digital transformation by combining domain experience with digital expertise.

We provide human and business-led digitisation of enterprises, programmes and assets. From top-level strategies to target operating model design, technology implementation and digital twins, we help clients strengthen their innovation capability while guiding them through a robust innovation process to identify transformative ideas which can be evaluated, piloted and scaled.

Platform

sideways6

Sideways 6's mission is to support large enterprises improve and grow by bringing employee ideas to life.

The Sideways 6 idea management platform works alongside the tools employees already use every day – like Microsoft Teams and Workplace By Facebook – enabling easy adoption and helping nearly four million employees across the world have their ideas heard. Embedding a culture of innovation means providing the tools for employees to share their insights and businesses to quickly identify the best ideas to bring to life.

Contact our expert

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