

A SUSTAINABLE BUILT
ENVIRONMENT THROUGH
SYSTEMS CHANGE



Existing
materials

Natural
materials

Cost

Growing
materials

Space

Testing

Insurance

Materials Fractal
2023-24

Executive Summary

1. Introduction

System Change aims to move beyond the existing, for us to identify new ways to achieve a far more sustainable built environment.



In this report we will explore one integral and interconnected part of that system, materials, and how we have sought to change it.

2. Materials

A small group, representing a range of actors in the built environment, came together to share experience and ideas, to learn from each other. The voices of designers, advocates, contractors and producers were heard, alongside the often-unheard voice of those in the Global South.

3. Prototyping

Potential solutions for change were identified, tested, refined and retested through a process

of prototyping – testing ideas in conversation with others in the built environment. Fail fast to learn quickly.

Ideas included leasing building materials, sourcing locally, building with existing materials and focusing on natural materials.

4. Challenges

Across all prototypes a number of common challenges emerged:

Space – a capacity to accommodate

Skills – to work in new ways

Performance – to guarantee materials

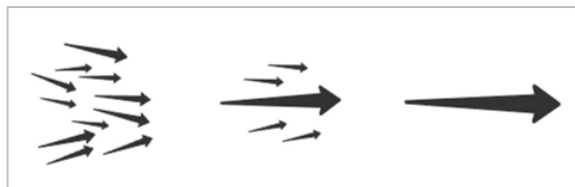
Availability – to do this now

Time – to change from business as usual

Cost – the biggest challenge of all. Perhaps we should consider **value** instead?

5. A Common Aim

Recognising a common set of challenges highlighted a common purpose too.



We realise we are aiming for the same goal and we face many of the same challenges, whatever our expertise or field of activity.

The key to success lies in recognising our common aim, and collaborating whenever, however and wherever we can to align our approach and accelerate our efforts.

6. Systems Change

At our “bigending”, this is a process without beginning or end, we characterized our work in the materials ecosystem through a play, representing the journey we have been on and our coalescence around a common approach.

We are the system and our work, our relationships and our growth define the sustainable built environment that we seek.

There are plenty of solutions available, and it's clear that the critical success factor is open-minded, supportive collaboration around a shared endeavour. That's incredibly exciting because it's something that we can all do today.

And so our work continues...

1. Introduction

How did this begin?

The UK Green Building Council (UKGBC), and all of us as members, have a simple mission:

UKGBC MISSION

TO RADICALLY IMPROVE THE SUSTAINABILITY OF THE BUILT ENVIRONMENT, BY TRANSFORMING THE WAY IT IS PLANNED, DESIGNED, CONSTRUCTED, MAINTAINED, REPURPOSED AND OPERATED.

We are actively pursuing a myriad of sustainability initiatives across the built environment. Although these are all making a contribution, even taken together they are not enough. If we are truly to achieve our mission, we need to evolve a new way of working. The process of Systems Change.

What is Systems Change?

We took as our starting point the realisation that systems are complex. They comprise a series of interactions between the component parts of the system and those operating within that same system.

Systems Change may then be defined as shifting component parts of the system – and the pattern of interactions between those parts – to ultimately form a new system that behaves in a qualitatively different way.¹

UKGBC Systems Change Conference

In September 2023, led by Elfrida Hamilton-Russell of UKGBC and facilitated by Systems Change experts Fiona Bibby, Megan Senaque and Russ Saunders, we began an initial six-month programme to explore “A Sustainable Built Environment through Systems Change”.

Invitations were opened to any and all UKGBC members. Participation was sought from regulators and designers, agents and investors, developers and contractors, occupiers, owners and materials producers.

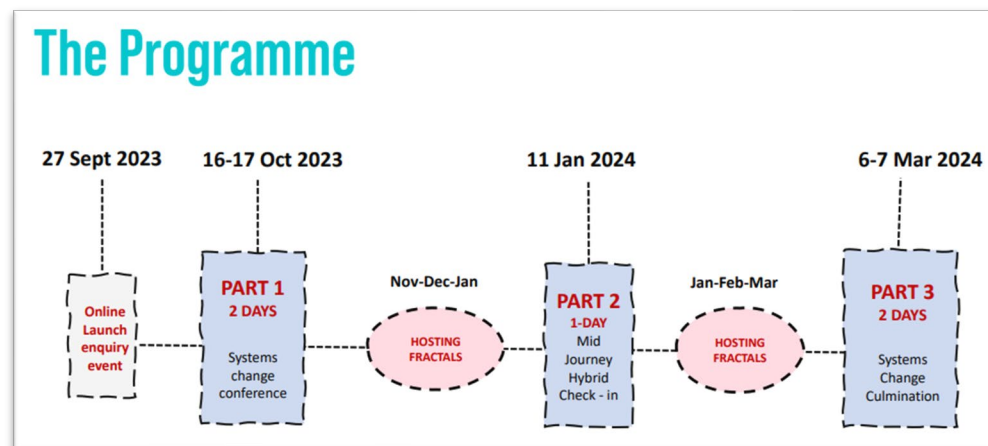
Together, through an evolving understanding from our hearts, head and hands, the emotional, intellectual and practical application of all we do, we quickly came to the realisation that **we are the system**.

As our initial conference proceeded, we began to describe our experience of the current system. Together we explored the way we work and the impediments we face. And at the conclusion of these early discussions we identified and formed into five “fractals” of the system as a whole:

- Purpose of the built environment
- Finance
- Voices / stakeholders
- Leadership
- Materials

This report follows the subsequent journey of the Materials Fractal before we re-convened as a collective group once more in March 2024.

¹ World Resources Institute



2. Our Fractal Group

Our Materials Fractal, convened at the conclusion of Part 1 of our Systems Change Programme, had a simple remit - to identify opportunities for Systems Change in the way we specify and use materials in the Built Environment.

With our growing understanding of what was needed to facilitate Systems Change we began to explore the specification, extraction and

production of materials within its own ecosystem. We considered sourcing, ethics, embodied carbon, the circular economy and finance, along with many other facets as we brought our collective experience and ideas to the discussion.

Our group comprised a range of backgrounds; from those working as an integral part of the materials ecosystem, be that in extraction,

production, specification or use, to those of us who were keen observers or occasionally interacting with the system, wanting to both learn and to contribute to the debate.

From this range of backgrounds and interests we began to prototype some ideas.



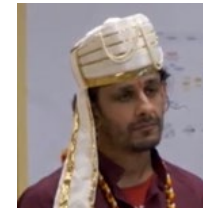
Cressida Curtis - Wates



Gregor Haran - Landsec



Laura Baron - Purcell



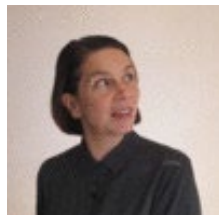
Sagar Sumaria



Simon Matthews –
Stephen George +
Partners



David Nicholson - Natural
Building Systems



Juliet Bidgood -
Architect/Urbanist



Macarena Cárdenas -
UKGBC



Sam Burdett – Skanska

3. Prototyping

What is prototyping?

Prototyping was introduced to us as a simple process in the exploration of ideas by the programme leaders and facilitators as we began to form our Fractal Groups at the end of our initial conference. Prototyping was presented as a method of live testing an idea, an approach or a product.

What did we prototype?

Within our group we began by looking for a single solution to test but quickly realised that we needed to explore multiple approaches to systems change in relation to material ecologies. Learning from initial fractal gatherings, where we had live tested our first ideas in the conference, we decided to start talking to colleagues and friends in the industry to widen the conversation.

As a group we had begun with the idea - *What if you could only lease materials?* We found this question compelling; we could see how this could change our relationship to how we source, use and recycle materials. Testing this we found it could work for elements of construction like facades, services or fit outs. As we continued we realised that in order to consider different building types and elements

of construction we needed to test multiple approaches across the system.

We began asking our networks, via LinkedIn and in person, for responses to a set of questions. What if...

1. *You can only lease materials, not buy them**
2. *50% of your materials to be sourced from within 30 miles of the site**
3. *What does a functioning market for used materials look like?*
4. *There are no new materials**
5. *There are only natural (biogenic) materials**
6. *What needs to be true to scale a take-back approach?*

And to share their thoughts on the following:

- What do you like about the idea?
- Why won't it work?
- What's the biggest thing that would need to be true in your field to make it happen?

* Initial ideas pursued through prototyping

Our results

We had strong responses from people who were enthusiastic about the potential for and importance of shifting thinking and offered their own perspectives. We developed an awareness of the diversity of roles and disparate initiatives happening in relation to each proposition.

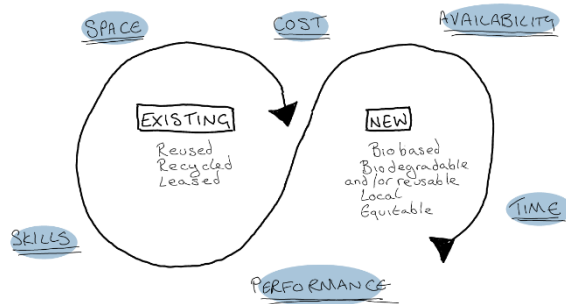
The group kept returning to material sourcing and its current impacts. We became increasingly aware of findings of the UKGBC knowledge hub on [Embodied Ecological Impacts](#) where they highlight how; *'In a world of globalised trade and supply chains, many negative impacts are transferred to sites and areas remote from the building site, such as deforestation, water scarcity, pollution, and even violent conflicts. These can be hard to identify in a fragmented, global industry that often lacks transparency.'*

Thinking of the whole system of which we operate as a group and as individuals we agreed that we wanted to see approaches that changed how we value material resources and how we accounted for not only their carbon impacts but their impacts on communities and biodiversity.

But of course, we discovered that there are many challenges too.

4. Challenges

Through the four ideas we prototyped we quickly found there were challenges common to all. Be it reusing existing materials or sourcing new ones, we identified six common themes.



Space

When considering new materials, especially biogenic ones, challenges relate to land use, ensuring it is appropriate, equitable, and local. With the reuse of existing materials, there are challenges relating to storage, testing and refurbishing space.

Skills

A key challenge identified related to the lack of skills in dismantling and salvaging materials, as well as designing with these types of materials. In addition, having skills where you need them, particularly in relation to sourcing

locally and growing biogenic materials is a challenge.

Performance

The legal and regulatory frameworks surrounding material manufacture and use in construction, particularly relating to testing, certification and insurance, make using reused or new innovative materials prohibitive.

Availability

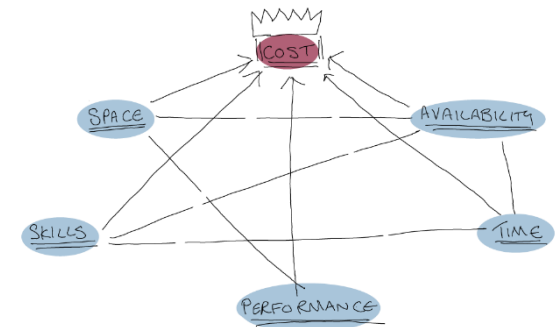
The availability of materials, be they reused or salvaged, or newly made from waste or biogenic materials, a key challenge is supply and demand.

Time

The perception that many solutions take more time than a business as usual (BAU) approach is a huge challenge. Dismantling materials from one building for reuse in another takes time, as does the testing and certification of new, innovative materials, and the teaching of new skills.

Cost

Cost was felt to be the biggest challenge across prototypes, with all other barriers feeding into and influencing the actual and perceived cost uplift with regenerative and circular material manufacture.

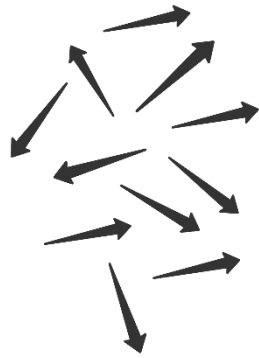


This list is not exhaustive, but in identifying the common challenges and understanding their interconnectedness, it is possible to zoom out and consider the wider system, its interdependencies, and key leverage points that may facilitate change.

In the current model, cost is king. All other challenges, perceived and actual, feed into increased cost. However, if we consider **value** rather than cost, we start to think differently about we might change the system. For example, upskilling the workforce has a monetary cost, but it also has inherent value - to society, the supply chain, and the local economy.

5. A Common Aim

As our prototypes developed and our discussions continued, we became aware that we were each advocating passionately for our preferred 'solution'. Those working with natural materials saw this prototype as the way forward, others working with existing buildings argued that we should pursue our re-use of existing materials and so on.



We had a choice. We could continue on our preferred trajectories and hope to bring others along with us. Or we could stand back and look at the bigger picture.

After a debate along the lines of the former, we began to realise that approach, worthy as it was, wasn't really what Systems Change is all about.

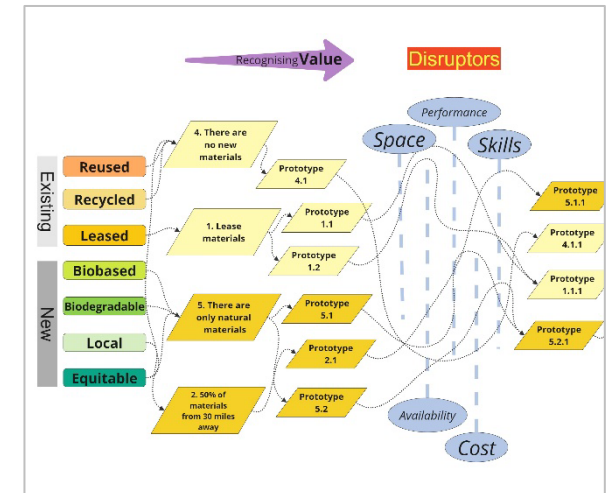
So we began to consider the bigger picture.



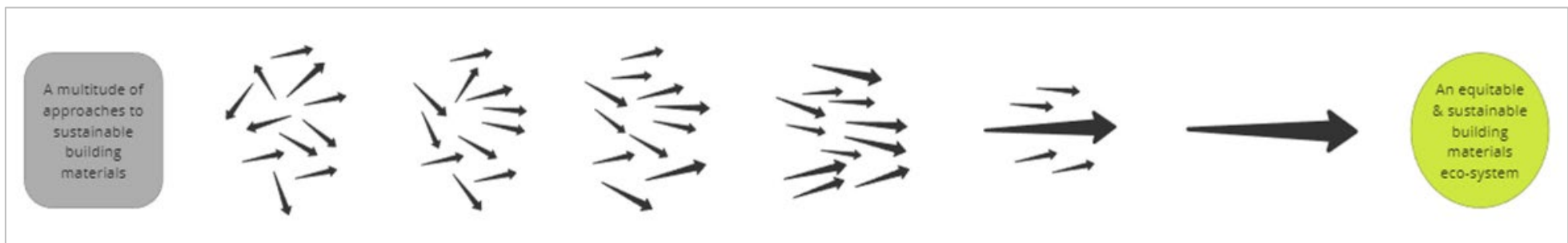
What had brought us together was a common aim. Our differences were minor in comparison. We began to realise that we don't need just one, or even some of the solutions we were debating. We need them all.

Our solution was becoming clearer. We should talk to each other, collaborate and learn from each other, keeping our common aim in mind.

A pathway emerged where we could all work towards our shared aim. (See Appendix A for full sized diagram).



We now had a route map to follow, **systems change** was beginning to take place.



6. Systems Change

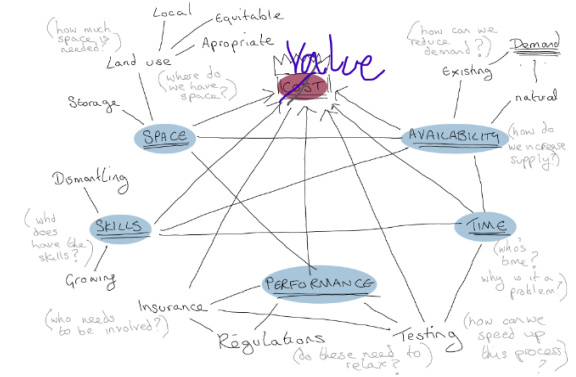
The end of this beginning brought us to the Programme's Closure: The Bigending. This term, coined by the UKGBC's programme team and the Systems Change experts, signifies the conclusion of our initial phase.

Our Bigending came to us with all the oomph. After our breakthrough towards convergent work, we were fully committed. We created a play for the final conference, we wanted to show what our journey looked like. In our play, we interpreted the usual stakeholders of the Materials Ecosystem and physically created a web of strings representing the challenges between these key stakeholders. We invited external participants at the conference to join us on stage, highlighting the interlinkages within the material ecosystems. Finally, we symbolically cut the strings to reveal the true key goal: recognizing the intrinsic value of materials over their monetary cost.

The play described the transformation of the built environment through innovative approaches to sustainable building materials: reusing existing materials, leasing materials, using natural materials, and sourcing materials locally. Guided by our Conscience - a key character representing ethical considerations - we emphasized the importance of equity and

fairness. The strings spread around us during the play represented common challenges in the built environment, such as space (e.g. storage availability for reusing), availability (where and how far does it make sense to get our materials, and therefore, how reliable can local sources be), performance (how do natural materials perform), skills (who knows how to do it, and will they be able to push through the current linear culture), and cost (no need to exemplify this one, we think). By shifting our focus from cost to value, where reusable, natural and easy to assemble and deconstruct materials would be preferred, we illustrated how to overcome these obstacles and work collaboratively towards an equitable and sustainable building materials ecosystem. The play highlighted the importance of cooperation, continuous dialogue, and ethical considerations in achieving systemic change in material extraction, design, construction, and operation practices.

This journey we've embarked on is **Systems Change**. It's a path guided by common principles towards a shared goal of convergence. It has required proactive collaboration, deep awareness of others' and one's own strengths and perspectives, adaptability, empathy, and compassion to



align interests through a holistic view. This has been a transformative path.

See an extract of our play [here](#), and hear some reflections on our journey [here](#) and [here](#).

What's next? We will continue sharing our knowledge, raising awareness, and advocating for action while keeping our minds and hearts connected.

There is so much more we could share; what is our current thinking on making systems change in the material ecosystem possible, what are the solutions already found, and how we can ultimately support a regenerative Built Environment?

If you would like to know more and join us on this journey, please get in touch with us via juliet@julietbidgood.com

7. Reflections and Next Steps



The Fractal work has convinced me it's possible to transform our sector into one that works for the planet.

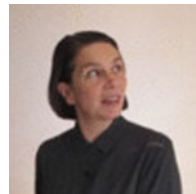
There are plenty of solutions available, and it's clear that the critical success factor is open-minded, supportive collaboration around a shared endeavour. That's incredibly exciting because it's something that we can all do today and is immensely fulfilling on a human scale.



Our work in the Materials Fractal offered me new perspectives on how to approach a transition towards a circular, regenerative built environment. Exploring questions and conceptual models in prototyping, revealed complex intersectionality between different systems. In my experience, it's this intersectional space where we find the greatest challenges, but also real opportunities to effect change. Prototyping ideas in a diverse, multidisciplinary group is exactly what is required to address these challenges.



The work the Fractal Group has carried out has been fantastic. We have unearthed some brilliant possibilities, but also seen that many possibilities are already out there and waiting to be utilised. The journey has highlighted to me what is possible when an open-minded group collaborate.



It's been inspiring to be part of a space where, knowing and not knowing are allowed - realising that together we can hold more complexity. It was good too to learn to use how we felt about the need to create regenerative systems, to trust our concerns and make them productive.

It has encouraged me to slow down a little and take time to articulate the wider considerations of choices being made, to ask questions in the earliest stages of a project.



Being given the space and time to really interrogate our current system and all its flaws and opportunities, has been invaluable.

As someone who is used to being given a defined outcome or deliverable, this process has at times been uncomfortable. However, freeing ourselves of predefined expectations has been an incredibly powerful and productive tool



The work we've done in this Fractal group was not just enlightening, it was inspiring and reassuring. It confirmed to me, in practice, that change happens when we're okay with being wrong and still keep pushing forward. It happens when we look beyond our own little world (perspective) and connect with what others need and can do. Most importantly, change will be best driven when we align our rational thinking with our values and what it's truly important. Do this together, and you'll see real convergent system change.

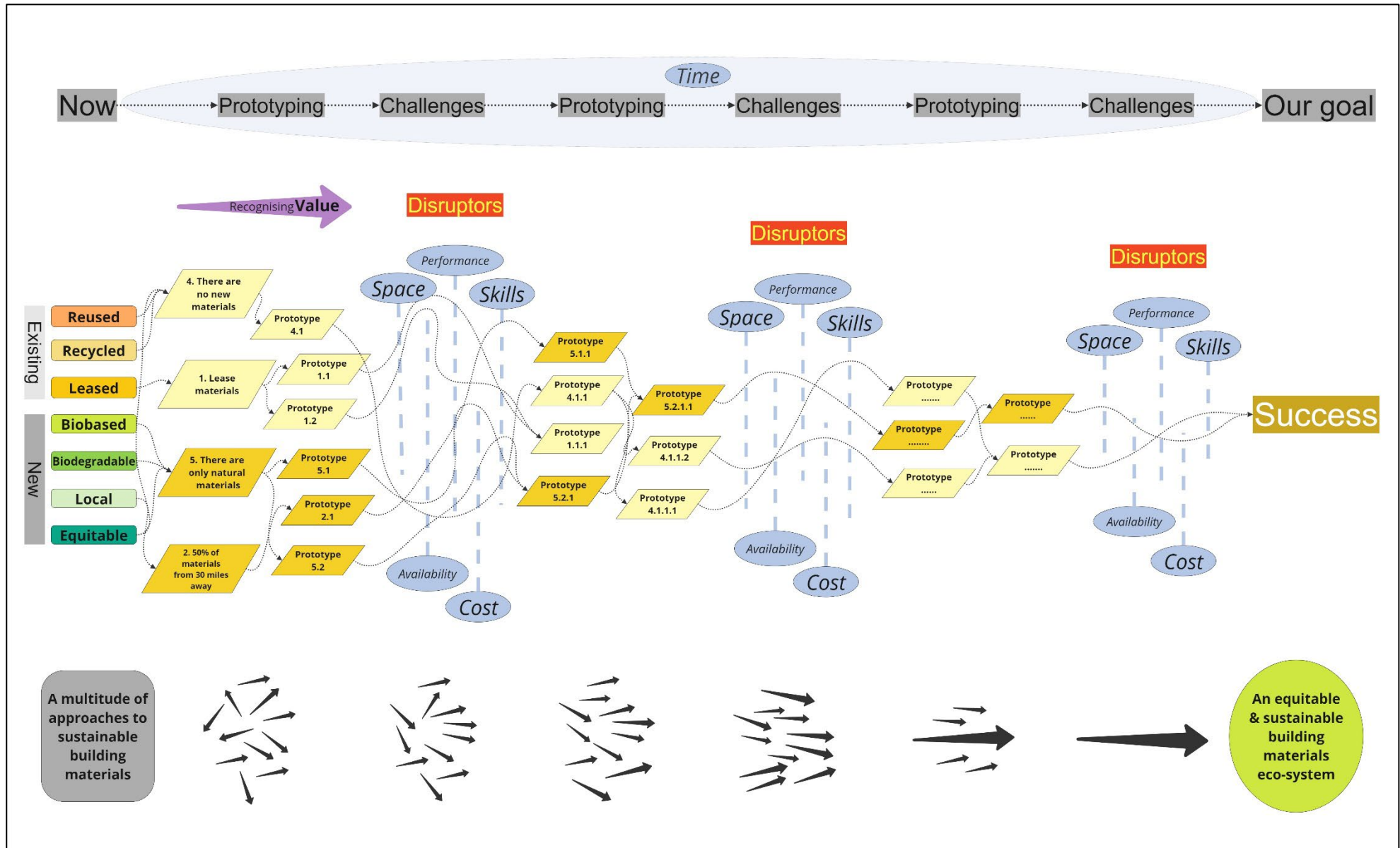
I am looking forward to continuing this path.



The programme has been inspiring. The opportunity for collaboration, uniting behind a common aim, has been incredibly powerful. My colleagues in the fractal group, and across the wider programme, have become my friends and companions.

I'm excited for the next steps, building on the important contribution of all across the sector, encouraging connections and facilitating real systems change.

Appendix A – Systems Change Pathway



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Relevant Research in Progress

The [IMPACTT](#) research project's aim is to link timber materials in buildings to the forest of origin.

The King's Foundation/ UCEM/ [2_year KTP research project to set up regional building hub](#)

Further insights

Progress towards convergent work – systemic thinking

