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# TRANSFORMING FOUNDATION INDUSTRIES: ENGAGING SMES IN INNOVATION

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## Acknowledgements

This research was commissioned by Innovate UK. We are very grateful to the project sponsors at Innovate UK for their input into this research. The interpretations and opinions within this report are those of the authors and may not reflect the policy positions of Innovate UK.

## About the Innovation Caucus

The Innovation Caucus supports sustainable innovation-led growth by promoting engagement between the social sciences and the innovation ecosystem. Our members are leading academics from across the social science community, who are engaged in different aspects of innovation research. We connect the social sciences, Innovate UK and the ESRC, by providing research insights to inform innovation policy and practice. We champion the role of social science in innovation and enhance its impact. Professor Tim Vorley is the Academic Lead. The initiative is funded and co-developed by the ESRC and Innovate UK..

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# 1. INTRODUCTION

The Transforming Foundation Industries Challenge aims to enable the sustainable future survival of the foundation industries in the UK (metals, glass, paper, ceramics, cements, bulk chemicals) by unlocking some of the barriers faced by the industry. The challenge seeks to understand the innovation profiles of UK foundation industries, the factors that shape innovation, and the barriers that businesses face. Ultimately, it aims to empower policy makers to ensure that the right support structures are in place to enable foundation industries to build long-term success.

The foundation industry label encompasses six industries that manufacture core materials commonly used by other manufacturers: cement, paper, ceramics, metals, chemicals, and glass. The industries count approximately 7,000 firms, which represents approximately 5% of the UK manufacturing sector. In 2020 these employed over 250,000 people (~10% of manufacturing employment) (ONS 2019a). The combined annual turnover of these industries is £67,5 billion (ERC 2021); however, they tend to underperform relative to UK manufacturing and the economy as a whole (Lawrence and Stirling 2016). Foundation industries' share of UK GDP declined by 43% (1996-2016) and it now has one of the smallest sectors relative to GDP in the OECD.

Enhancing the innovation and growth potential of foundation industries is important because of these contributions to the UK economy but also their broader impacts. They are also crucial parts of UK supply chains, enabling growth and innovation across the manufacturing sector. Collectively, these industries exhibited sluggish recoveries from the 2008 Financial Crisis and are increasingly facing international competition (Chowdhury et al. 2018). While some firms and industries may benefit from renewed attention to national supply chain resilience catalysed by Covid-19, the full impact of the pandemic has yet to be tallied. The sector's ongoing sensitivity to Brexit uncertainty (ERC 2021) suggests that performance across these industries is likely to be variable in the short- to medium-term. Strengthening these foundations of the British manufacturing sector is, therefore, crucial to ongoing economic recovery and resilience. Furthermore, because of their position in supply chains and high levels of energy intensity, innovation in foundation industries can make a significant contribution to net zero and green recovery efforts. This can come through innovations to increase energy efficiency of production, use more recycled materials in production, or improve the environmental impact of products (e.g., glass for windows that retains heat more effectively).

However, recent research found that innovation activity in foundation industries is lower than in competitor nations and clear market failures affecting innovation performance (ERC 2021), which suggests a strong rationale for policy development to enhance innovation and growth. The same research also found that innovation is constrained by a number of structural barriers, including high barriers to entry, underdeveloped management and leadership skills, the encroachment of lower-cost imports on firm market share, mindsets resistant to innovation, reluctance to collaborate, and onerous regulatory and environmental pressures. Additionally, taking a comparative view, the Institute for Progressive Policy Research (IPPR) found that EU competitors provide more and different support to their foundation industries (Lawrence and Stirling 2016), suggesting that there are considerable opportunities for the UK to leverage policy to stimulate evolution in UK industries. The policy challenge, then, is to identify priority areas for intervention and effectively target programmes to reduce deadweight loss and increase value for money.

The principal aims of the project are to provide further insight into micro, small and medium sized enterprises (SMEs) in foundation industries to (1) understand their innovation intentions - focusing specifically on their willingness, capacity and capability to innovate and to (2) provide a tool to diagnose areas where firms could benefit from support and to feed into innovation policy development.

This demographic is particularly important to understand as SMEs (defined as firms with fewer than 249 employees) represent over 98% of the sector (see Table 1). Furthermore, as the following section which reviews the findings of previous research suggests, these foundation industry firms appear to be less likely than larger foundation industry firms to innovate, invest in R&D, and adopt new technologies. Consequently, foundation industry SMEs represent a large and important target for public innovation support.

#### **This report asks:**

- **What are the innovation intentions and practices of foundation industry SMEs?**
- **Are there discernible trends by foundation industry firm size (micro, small, or medium) or industry (metals, glass, paper, ceramics, cements, bulk chemicals) that can help target future research and policy to stimulate innovation in foundation industry SMEs?**
- **What insights do foundation industry innovation profiles and practices yield for foundation industry innovation programme development?**

To answer these questions, we surveyed existing research (summarised in Section 2) to understand the evidence base and gaps, particularly around the performance and practices of foundation industry SMEs. This informed the construction and adaptation of a framework, which conceptualises innovation profiles as the outcome of firms' willingness, capability, and capacity to engage with the risks of innovating (Section 3). Building on existing research and with our framework in mind, we then surveyed a sample of 140 foundation industry SMEs about innovation intentions and practices (methodology in Section 4). An overview of significant results from this survey is presented in Section 5. Finally, Section 6 provides an overview of the analytical tool we produced to help guide more targeted inquiries by Innovate UK and their stakeholders.

## 2. CONTEXT AND PREVIOUS RESEARCH ON FOUNDATION INDUSTRY INNOVATION PROFILES

Previous research on the state of foundation industries has focused on innovation readiness, future skills, and equity, diversity, and inclusion. Taken together, these have generated significant insights about the state of the industries and the challenges and opportunities they face. To date, however, the focus has been on comparing the experiences of industries to one another, building a narrative about common characteristics, and strategizing how conceptualising these industries collectively can draw attention to their unique challenges. These studies also covered the full range of foundation industry firm sizes and data collected tends to overrepresent larger businesses. As such, while this data is useful for sketching out trends across the industries in the aggregate and providing clues as to where foundation industry SMEs may be underperforming relative to other firms, they are limited in their ability to provide detailed insight into the foundation industry SME experience. Sections 4 and 5 outline the research that we undertook as part of this study to fill this gap. In this section, we draw on these reports to present some background on the foundation industries and highlight some themes for further investigation. In some cases, our findings validate these conclusions while in other cases they challenge them.

Of the total of 7,085 firms active in the foundation industries 98% of these are SMEs. Of these, the vast majority (4,565 or 65%) are micro enterprises, while nearly a quarter are small firms and 10% are medium sized businesses (ONS 2019b). This pattern is roughly proportionally replicated across each foundation industry (see Table 1) despite significant differences between them in terms of number of firms and employment. The foundation industry firms surveyed were largely well established, with most businesses older than 20 years. Micro and small enterprises were slightly more likely to be established within the last 20 years (over 20% of micro firms in the sample only began trading within the last five years). This is consistent with previous assessments that the foundation industries face relatively low levels of churn and high barriers to entry.

**Table 1. Employment in foundation industry firms (ONS 2019b)**

Industry	Micro (1-9)	Small (10-49)	Medium (50-249)	Large (250+)	Total	Employed
Cement	770	275	100	100	20	37,450
Ceramics	430	70	35	35	10	17,550
Chemicals	785	280	145	30	1,240	47,830
Glass	475	185	65	10	735	23,770
Metals	1,315	500	180	35	2,030	18,642
Paper	790	370	175	35	1,370	58,050
<b>Total</b>	<b>4,565</b>	<b>1,680</b>	<b>700</b>	<b>140</b>	<b>7,085</b>	<b>203,292</b>

Foundation industries are, by definition, those that sell primarily to commercial manufacturers rather than retail or end users. The majority of foundation industry firms in the sample sell their products only to other businesses in the supply chain, while several reported a 50/50 split. A percentage of each size band (approximately 20% of micro and small businesses and less than 10% for medium and large businesses) did, however, report primarily supplying the retail end of the supply chain.

Previous research highlighted that foreign ownership was relatively common in these industries, a characteristic that entailed both challenges and opportunities for innovation readiness. Foreign ownership was particularly noted in the cement and metals industries (ERC 2021). Export intensity varies considerably between foundation industries. The ceramics and bulk chemicals industries were more likely to export goods and services, while cement and glass were the least export-intensive. Larger firms were more likely to be export active (large, 80%; medium 75%; small 60%), with only 30% of small foundation industry firms and 25% of micro firms reporting revenues from exports.

Overall, this data paints a picture of a relatively well-established set of industries where foundation industry SMEs are primarily (though not exclusively) geared towards supplying national manufacturing and construction industries. While there is evidence that these industries have suffered contractions following the Great Recession and Covid-19 pandemic, data also suggests that most foundation industry SMEs managed some degree of innovation through the crisis.

### **Smaller firms were less likely to innovate...**

The ERC “Innovation Readiness in UK Foundation Industries” (ERC 2021) study identified some important potential weaknesses in foundation industry innovation readiness, practices, and intentions. Notably, foundation industry SMEs appear to innovate at lower rates than larger foundation industry firms, with the likelihood of innovation generally declining with firm size. When asked if they had introduced new or significantly improved goods or services in the last three years, over 75% of large foundation industry firms said they had. However, this was true of only 68% of medium, 58% of small, and less than 30% of micro foundation industry firms. The same pattern holds for process innovation, with larger foundation industry firms more likely to have adopted new processes. Where new processes were introduced, larger foundation industry firms were more likely to characterise these as “new to the market” (60%). Foundation industry SMEs were more likely to describe their new processes as “new to the business” (71%). This study did not ask about business practices, which can have important impacts on productivity, a gap that we tried to fill with our survey. This suggests a degree of innovation diffusion where processes adopted in other (larger) foundation industry firms trickle down to smaller foundation industry firms over time. This is also consistent with attitudes towards risk (see ERC 2021, 41) reported amongst foundation industry SMEs.

### **...Or invest in R&D**

Similar patterns were apparent in R&D investment and foundation industry firm investment in skills, leadership, and recruitment. In this sample, foundation industry SMEs put more emphasis on increasing skills and recruiting new staff as well as investing in capital than in R&D. Notably, for foundation industry SMEs, investment in R&D was among the least selected options only surpassing developing export markets. Furthermore, the likelihood of R&D investment declined with foundation industry firm size from a high of 76% for medium enterprises to a low of 47% for micro enterprises. When asked about whether they had invested in new technologies or processes to improve energy/resource efficiency in their companies, foundation industry SMEs were far less likely to say they had - although size clearly plays a role. While about 70% of medium sized foundation industry firms had invested in improving energy use, only about 30% of micro foundation industry firms and 45% of small foundation industry firms had done so.

### **Innovation is driven by internal decisions**

When asked about the sources of their motivations to innovate, foundation industry firms overwhelmingly responded that internal pressures (70%) were important versus external pressures (31%), or a motivation to maintain a steady state (19%) (ERC 2021, 63). This finding suggests that not much is being demanded of foundation industry firms, by customers, regulators, or civil society that requires them to consider changing how they manufacture products or other internal processes. Notably, reducing energy use did not rank highly among decisions to innovate (although was most significant for medium and small businesses).

### **Cost is the most significant barrier to innovation**

Among barriers to innovation, cost and/or availability of finance ranked most highly for medium sized foundation industry firms, followed by uncertainty about Brexit, and “no need due to market conditions”. These establishments also cited lack of innovation technology, market dominated by established businesses, and no need due to previous innovation at similar levels. Both medium and small businesses also frequently noted that direct costs of innovation were too high (this was the most significant factor for small businesses). Businesses cited the lack of qualified personnel at similar rates across size bands with this standing out for micro foundation industry firms as one of their primary concerns. For micro foundation industry firms, difficulty in piloting innovations due to continuous production processes and market conditions were about equal with excessive perceived economic risks and availability of finance.

### **Collaboration for innovation is limited**

Rates of collaboration, of seeking external knowledge, and of seeking external funding for innovation are all indicators of whether foundation industry firms perceive innovation as worthwhile and their willingness to access external assistance to make it happen. This data indicates that foundation industry firms were more likely to collaborate with foundation industry firms in their supply chains than other organisations, but levels of collaboration are quite low overall. Under half of large foundation industry firms reported working with foundation industry firms in their supply chains and only 40% stated that they worked with organisations outside of their supply chains to develop new products, services, or processes. foundation industry SMEs collaboration patterns with partners within their supply chains was comparatively high (>64% for all sizes).

This section highlights only some of the most significant insights from the UKRI data. One of the most notable findings was the very minor differences between foundation industries in their innovation profiles and practices. This suggests that the foundation industries can be effectively studied as a collective and that practices do not differ substantially between them in the aggregate. Overall, it contributes to a picture of foundation industry SMEs as less innovative, devoting fewer resources to R&D activities, that are highly sensitive to costs of innovation, and with limited engagement externally for innovation support. In short, this overview provides a reasonable expectation that targeted public intervention might improve engagement in innovation activities.



However, it is not evident from this previous research why and where foundation industry SMEs are struggling to innovate. For example, it may not make sense to try to alleviate the cost of innovation if firms are not willing to pursue innovation in the first place. And existing programmes may not align appropriately with the challenges that foundation industry SMEs that are willing to engage in innovation are facing in developing their capability and capacity to do so. In the following section, we propose a framework to conceptualise innovation outcomes as the product of an alignment between firm willingness, capability, and capacity to innovate. This enables us to more effectively diagnose which aspects of foundation industry firms' innovation outlooks present opportunities for intervention. In Section 6, we translate this framework into a tool for Innovate UK and their stakeholders to engage with foundation industry firms directly to diagnose innovation strengths and weaknesses and inform policy design.



## 3. CONCEPTUALISING INNOVATION READINESS

A conceptual framework was developed based on an understanding of innovation as an ongoing process shaped by a variety of forces, both internal and external. While many studies focus on R&D investment as a metric of firm innovation performance, for instance, so many decisions affect whether those investments are made, how many resources are dedicated to innovation and over how long, and whether those investments are reasonable bets given foundation industry firms' understanding (and tolerance) of risks, internal resources, and ability to access external support. Why foundation industry firms choose to innovate, or not, is a function of more than available resources and touches on areas as diverse as entrepreneurship and management; networks and knowledge flows; workforce development, talent, and skills; organisational culture and psychology; and more.

We organise this framework around three cores - willingness, capability, and capacity:

### **Willingness - Openness to change and growth**

Appetite and openness to engaging in innovation as well as to engage with external resources (e.g., government support) to innovate. This primarily touches on mindsets related to innovation, including perceptions of need for change (perceived drivers of innovation), confidence in engaging with external resources and partners, and overall risk profile.

### **Capability - Access to resources to drive change**

The ability of firms to innovate with the tools that they currently have. This allows us to assess their internal resources and ability to access external resources as needed to drive innovation. While every foundation industry firm will have different needs depending on their innovation goals and existing capabilities, it is possible to evaluate innovation readiness across a variety of standard categories such as technical skills, management skills, financial resources, research and knowledge, strategic planning mechanisms, business engagement and market development resources etc.

### **Capacity - Availability of resources to drive change**

While foundation industry firms may have internal capabilities (and external resources might exist), capacity reflects their ability to dedicate these to innovation. There may be competing uses that mean that existing capability is engaged in other aspects of the business. As such, this evaluates how respondents plan for, balance, and perceive the opportunity costs of innovative activity.

The organising logic of the framework is sequential. If foundation industry firms do not exhibit a willingness to innovate, then they will not proactively innovate, or do so at scale, regardless of whether they have favourable capabilities or capacities. If a foundation industry firm is willing to innovate but lacks the capability to do so, then they definitionally have capacity constraints as well. Foundation industry firms that are willing and capable of innovating may, however, lack capacity due to perceptions that resources would better be used elsewhere in the business. Thinking about innovation readiness in these terms can help to more precisely identify barriers and opportunities within existing structures. A tool based on this framework was designed to be used by Innovate UK and their stakeholders to target foundation industry firms and identify innovation potential.

## 4. METHODOLOGY/APPROACH

The approach taken to this research was to build on the foundation of the Innovation Readiness report (ERC 2021). The survey highlighted that foundation industry SMEs comprised the majority of foundation industry firms, and that these foundation industry firms innovate less than large foundation industry firms. Therefore, a survey was developed by incorporating innovation questions from the ERC study adjusted for foundation industry SMEs. A pilot survey was conducted which informed adjustments to the final survey questions. This was conducted telephonically with 140 foundation industry (see Table 2). The sample sought to ensure representation across all industries and firm sizes. Microenterprises are underrepresented and small enterprises are overrepresented compared to the foundation industry firm population. Foundation industry firms in the Cement and Metals industries are underrepresented while foundation industry firms in the Paper industry are overrepresented.

**Table 2. Employment of foundation industry sample**

Industry	Micro (1-9)	Small (10-49)	Medium (50-249)	Large (250+)	Total	Employed
Cement	3	9	1	0	13	242
Ceramics	7	5	1	1	14	2,161
Chemicals	9	16	2	2	28	1,174
Glass	3	4	2	0	9	271
Metals	9	15	5	1	31	1,257
Paper	13	23	8	1	45	2,850
<b>Total</b>	<b>44</b>	<b>73</b>	<b>18</b>	<b>5</b>	<b>140</b>	<b>7,955</b>

The majority of foundation industry firms surveyed were micro and small enterprises (n=116) and most had been established for more than 20 years (n=94). Most foundation industry firms were family owned (n=92). The survey was conducted over the phone using a computer assisted interview (CATI) approach between February and March of 2022.

Due to the length of the survey and limited sample size several questions were open-ended allowing for qualitative assessment of the data, and a nuanced understanding of innovation practices and obstacles in foundation industry SMEs. Answers to open ended questions were coded and have been used to provide illustrative quotes of the aggregate trends identified in the quantitative data.

The data analysis on the prevalence of innovation activities, types of innovation and the reasons for innovation activity were then used to inform the development of a tool which is intended to facilitate a discussion of the innovation journey unique to each foundation industry firm.

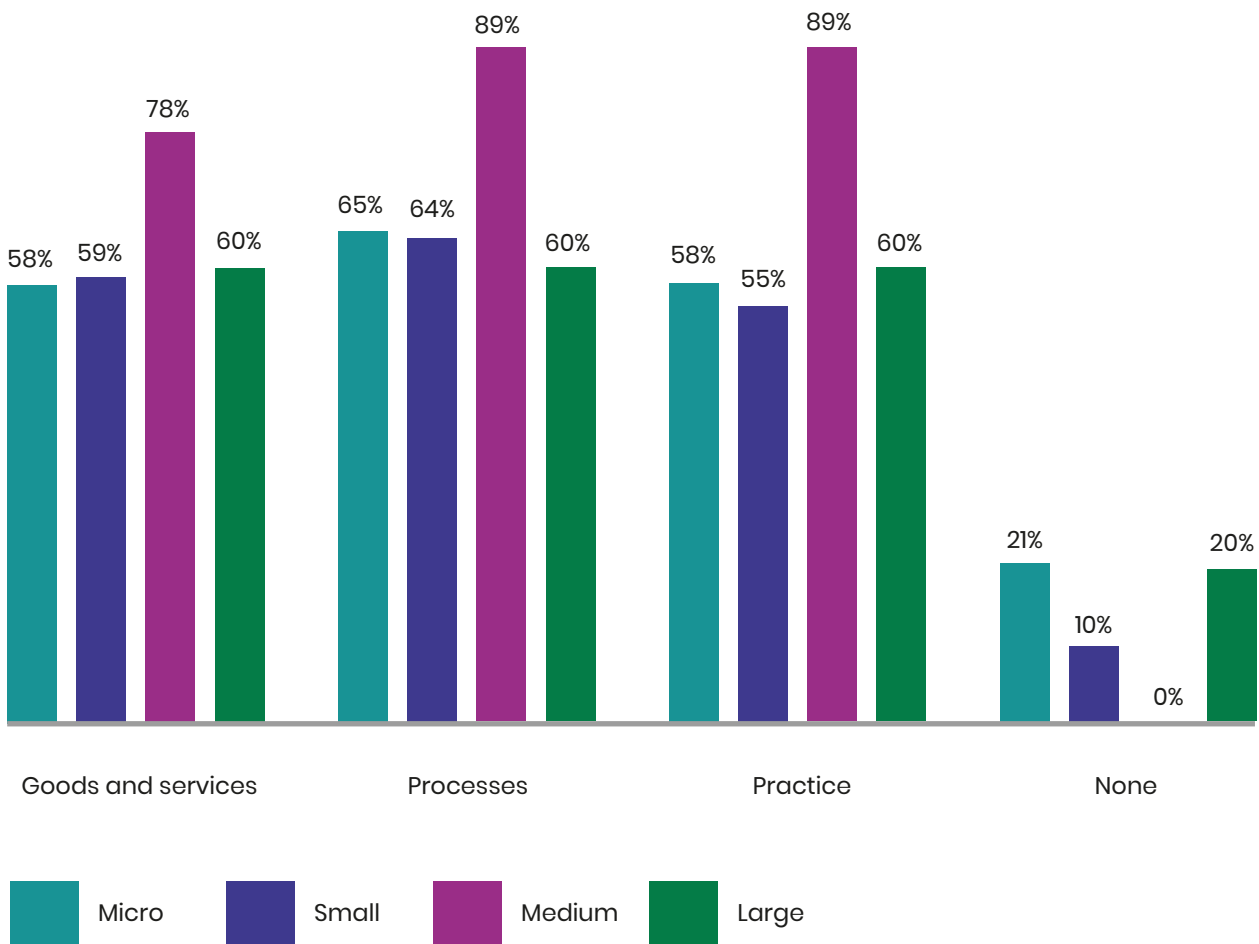
## 5. FINDINGS

Our survey replicated some parts of the ERC research (2021) and confirm or challenge how these findings were specifically relevant to SMEs. It also included additional questions to interrogate firm willingness, capability, and capacity more directly and to close any gaps. The CATI approach limited the number of questions we could ask but, as noted above, we were also able to ask open-ended questions that gave us more insight into specific dynamics and gave foundation industry firms more latitude to select and explain their answers. Consequently, while our results did find similar patterns to those elaborated in previous research, other themes from our data stand in contrast.

### Foundation industry SME innovation is prevalent and frequent

The majority of foundation industry SMEs introduced new or significantly improved goods (n=86), processes (n=95) and practices (n=85) in the last five years (see Figure 1). These reported levels of innovation appeared similar across foundation industry sectors. Less than 10% of foundation industry SMEs had made no significant improvements at all over the last five years (n=13), concentrated in micro enterprises (n=9). Conversely, all medium sized enterprises innovated in the last five years, and were substantially more likely to have improved goods and service, processes and business practices.

**Figure 1. foundation industry innovation by foundation industry firm size over the last five years**



The pattern of past innovation across enterprise sizes corresponded with R&D spending across goods and services, processes and business practices in the last five years. While 50% of medium sized foundation industry enterprises had R&D spending greater than £100,000 per annum, only 14.75% and 5% of small and micro foundation industry enterprises respectively had this level of spending, although micro and small foundation industry enterprises were less likely to have no R&D spending (15% and 14.75% respectively). There was no significant difference between R&D spending levels and innovation type (goods and services, processes and business practices). Together, this supports the prior research which found an inverse relationship between enterprise size and past innovation propensity. This research expands upon prior research by exploring the potential influence that foundation industry firm size has on innovation propensity.

### Foundation industry SMEs differ in their innovation activity

Foundation industry SMEs differed substantially in their overall business aspirations. The data showed that the plurality of foundation industry SMEs are profit focused (n=68) while 24% (n=34) of foundation industry firms emphasise scaling their operations. The third most common foundation industry firm aspiration is to maximise personal satisfaction (n=26), which were concentrated in micro and small enterprises. Those that aspired to grow most commonly increased in employee numbers in the last 12 months and were least aiming to maximise profitability. The majority of foundation industry SMEs that aimed to maximise profits had remained the same size, as had those that sought to maximise personal satisfaction. Despite the concentration of personal satisfaction aspirations in micro and small foundation industry enterprises, the data showed that differing aspirations had similar proportions of foundation industry firms that had conducted innovation in the past, similar levels of R&D spending and similar proportions of foundation industry SMEs with plans for future innovation. Therefore, although aspirations appeared to influence growth, it did not appear to directly influence or explain differences in innovation practices or plans for future innovation.

Rather than overarching business aspirations, innovation appears to be influenced by more specific foundation industry firm objectives and ways of doing business. A key reason for differences in past and future innovation in foundation industry SMEs appears to be linked to their approach to embedding innovation practices within the business. This was not directly evident from the quantitative data since most foundation industry SMEs innovate frequently (n=95) and were likely to invest in innovation over the next 3-5 years (n=98), and most foundation industry SMEs reported a significant positive impact of innovation on their businesses (n=105). Most demonstrated their willingness to support innovation through the high importance they placed on training (n=126).

The importance of specific foundation industry firm objectives and ways of doing business was more directly evident through the qualitative responses to questions about what they sought from innovation, why they were hesitant, and what resources they utilised to enhance their innovative capabilities. Innovation was often founded in a culture of continuous improvement:

*“It is all that we do. We are a start up developing new technology.” Small bulk chemicals LLC, 5-10 years old (aiming to scale)*

However, innovation activity was more often reactive than proactive, with requests from customers being the most common reason for making a change (also see Figure 2):

*“It is completely customer led, so we have introduced taking plastic out of our gift wrapping and using just labels.” Small paper and pulp LLC, over 20 years old*

*“We only change our product if there is a necessity to do so from the client or environment.” Micro family-owned chemical firm, over 20 years old.*

Similarly, foundation industry firms introduced new products, services or ways of working to:

*“offset supply chain restraints.”*

and

*“Due to covid, the supply chain has been disrupted badly, so we are keeping customers informed and being proactive rather than reactive.”*

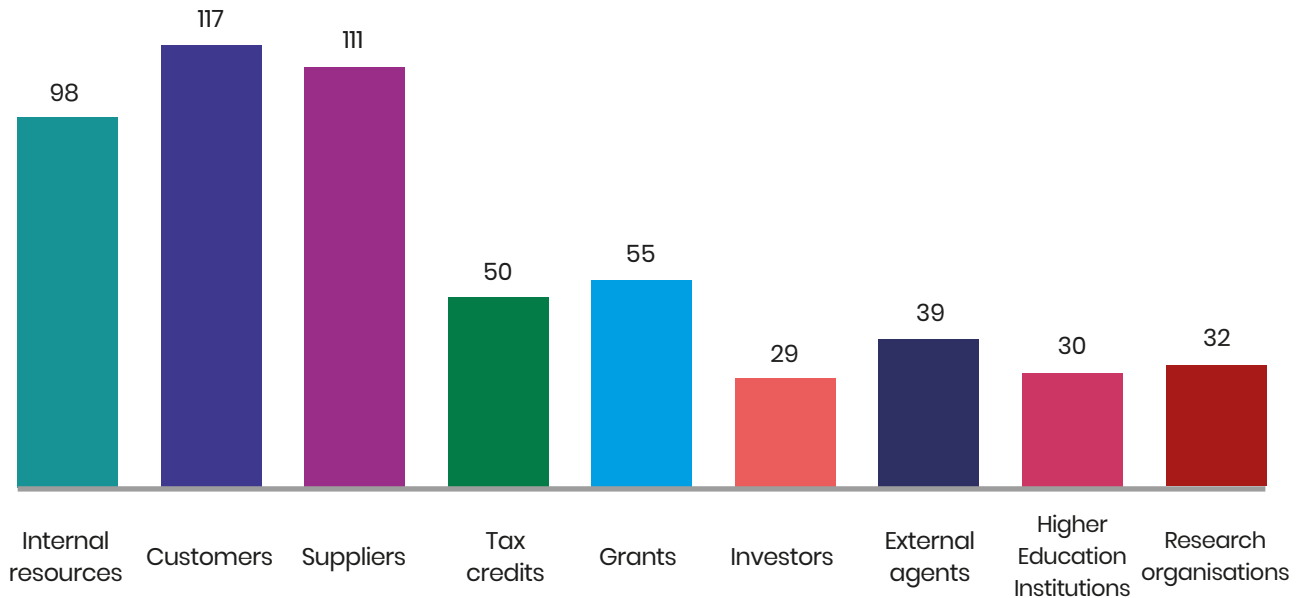
Previous findings (see ERC 2021, 78) showed that approximately 20% of foundation industry firms did not innovate due to a perceived lack of need. This is similar to the current findings that, when asked why they don't innovate, the majority of foundation industry SMEs that accepted the premise of the question (n=86) explained that innovation was driven through reactivity to problems (n=36) or needs identified:

*“We only change our product if there is a necessity to do so from the client or environment.”*

*“We are performing well, but if customers complained we would change more frequently.”*

Innovation reactivity to supply chain is supported by the quantitative responses to a question on the most important resources for foundation industry SME innovation activity (see Figure 2). Collaboration with customers (n=117) and suppliers (n=111) were the two most important resources. This contrasts with ERC's (2021) findings, which found that “internal” forces had more influence on firm decisions to innovate than “external” factors (such as competition or demands from customers) (see ERC 2021, 63). It is possible that nuances in the wording of these questions played a role in producing these notably different results - we asked what was important to R&D processes and the ERC question asked about the importance of different “pressures” on decisions to innovate. However, the relative consistency with which foundation industry firms responded to our question, combined with the qualitative confirmation provided in the open-ended responses, provides strong support for the argument that customers and suppliers have a strong influence on firm innovation decisions. This is also consistent with previous results that found collaboration was strongest between foundation industry firms and their customers and suppliers.

**Figure 2. Important resources for SME foundation industry innovation**



There was no significant over- or under-representation across foundation industry firm size in those that were reactive in their approach to innovation, nor in those who identified customers or suppliers as important resources for their innovation process. However, foundation industry firm size did appear to influence the capacity that foundation industry firms were able to dedicate to innovation. In line with the importance of the supply chain to foundation industry SME innovation, suppliers and orders (n=105 and n=101 respectively) were areas where instability was most likely to affect their ability to plan for innovation. The link between a (customer centric) reactive approach to innovation planning and order instability becomes clear through the qualitative data:

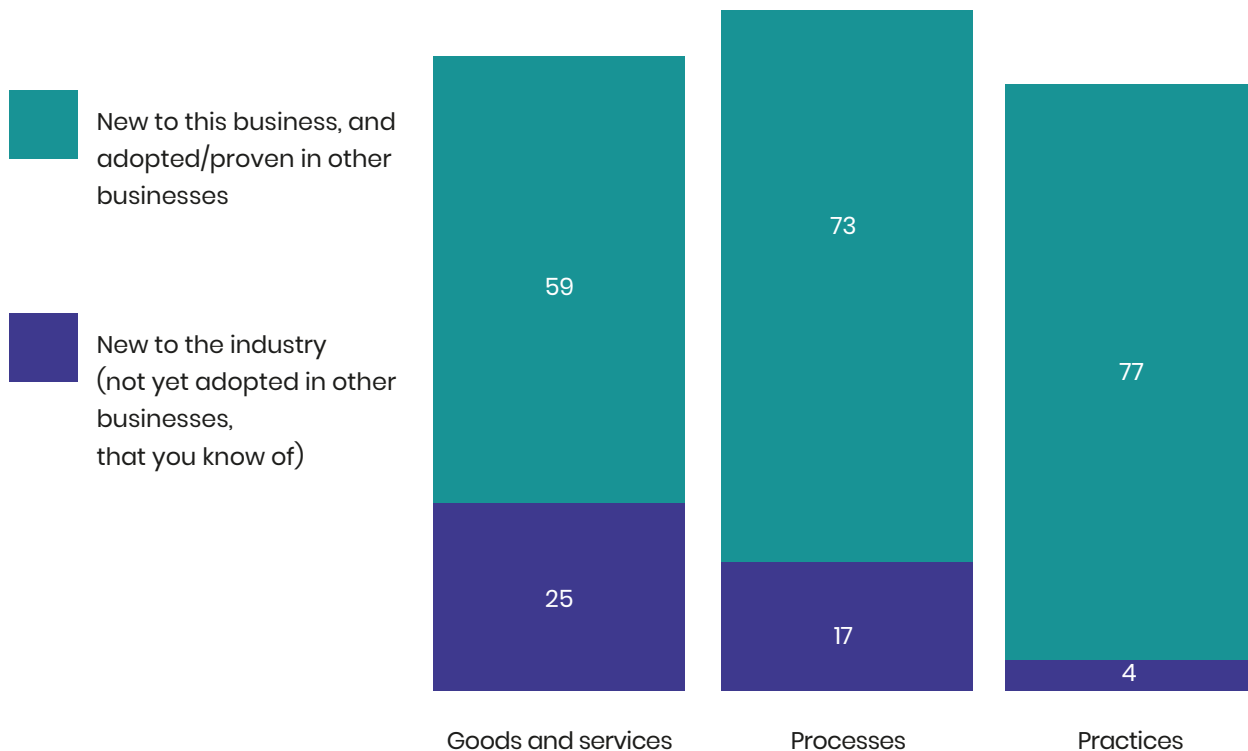
*“Schemes or schedules sometimes go awry depending on customer requirements.”*

While the innovation plans of 67% of micro foundation industry enterprises were influenced by instability in orders, only 50% of medium sized foundation industry enterprises were so influenced. Conversely, the innovation plans for only 60% of micro sized foundation industry enterprises were influenced by instability in energy prices, while the innovation plans of 94% of medium sized foundation industry enterprises were influenced. Larger foundation industry firms affected by energy instability provides an explanation for findings in the previous study that while about 70% of medium sized foundation industry firms had invested in improving energy use, only about 30% of micro foundation industry firms and 45% of small foundation industry firms had done so.

### Innovation or adoption...?

Most innovation conducted and planned in foundation industry SMEs is not novel. Rather, foundation industry firms adopt innovations already established in the industry (see Figure 3). Innovation that was new to the industry was concentrated in goods and services, followed by processes. Conversely, new-to-business improvements related mostly to process improvements, and were most often in the form of capital expenditure on improved equipment.

Figure 3. Innovation novelty



Many of the innovation adoptions that relate to capital expenditure are not directly supported through grant funding programmes. For example, some grant funding supports only depreciation expenses on only moveable capital<sup>1</sup>, and others must be specific to the approved innovation project<sup>2</sup>. This may explain the limited number of foundation industry SMEs that placed importance on grants as a resource in their R&D process (see Figure 2) and also suggests that programmes which support improvement through capital acquisition might find a more receptive audience than innovation-focused grants.

<sup>1</sup> <https://www.ukri.org/councils/innovate-uk/guidance-for-applicants/costs-we-fund/costs-guidance-for-non-academic-organisations>

<sup>2</sup> <https://www.ukri.org/councils/innovate-uk/guidance-for-applicants/costs-we-fund/costs-guidance-for-small-business-research-initiative>



Perhaps unsurprisingly, costs were most often given as the reason why foundation industry SMEs are hesitant to introduce new products, processes or ways of doing business. The link between costs for capital outlays and government support, grant availability in particular, is highlighted in some of the detailed answers provided. For example:

*“...it is so expensive. We are a chemical manufacturer and our industry has been around for a long time. Everything is geared for the pharmaceutical industry, which makes everything look like it is clean and nice. Everyone loves pharmaceuticals and everything is geared towards them because they have tonnes of money. There is not much that is there for normal manufacturers like us. There aren't many incentives to employ people, not many grants, there isn't much and there used to be more. We are in a reasonably deprived area and you would think the Government would be doing more about that. As a result we take all the risk.”*

*“...in this industry getting new machinery costs a lot more and Brexit hasn't helped. We haven't been supported at all by the Government even during Covid within manufacturing. Unlike the leisure and hospitality industries, we haven't received any support over the last 2 years. Regarding Brexit, we buy a lot of raw materials from Europe, for example, bottles and packaging and delays in shipping has a knock on effect with our customers, hence why we can't get new machinery.”*

Further, innovation hesitancy due to costs was concentrated in micro and small enterprises. However, the majority of all foundation industry SMEs (n=65) rejected the premise that they are hesitant to innovate.

Overall, the quantitative data supports a conclusion that foundation industry SMEs are innovative and have intentions to continue innovating, however the qualitative answers suggest that there are varied individual opportunities to support more novel and frequent innovation in foundation industry SMEs and that encouraging sustainability is one area where there is scope to improve innovation performance. The following section provides an overview of the tool developed to facilitate an understanding of these opportunities.

## 6. TOOL

The responses of the survey were used to develop and pilot a tool that will enable discussion about innovation with foundation industry SMEs. The tool incorporates the innovation readiness framework categories of willingness, capability and capacity, and is tailored to those areas of foundation industry SME activities which the data reveals were key characteristics of their propensity to innovate, and the obstacles they faced in doing so. We drill into how each of these categories plays out across five dimensions: workforce, management, production, technology and customers/markets (see Table 3).

**Table 3. Table of innovation readiness assessment**

	Workforce	Management	Production	Technology	Customers/ Markets
Willingness	Incorporated improvement KPIs	Working to identify opportunities for improvement	Openness to investing in production changes	Have identified potential technology	Customer feedback is used for improvement
Capability	Appropriately skilled staff	Frequency and breadth of business planning	Appropriate equipment is in place	Ongoing engagement with key suppliers and adoption of new tools	Customer relationship management system in place
Capacity	Flexibility in redeploying employees	Empowered decision making	Relevant equipment available to be used in R&D processes	Relevant technology acquired and ready for use in R&D	Capacity to devote resources beyond satisfying basic customer/market demands

Examples of some of these areas of willingness, capability and capacity to innovate are illustrated with quotes from the survey below.

### Workforce

The data showed that foundation industry SMEs have demonstrated innovation in the past and have plans for innovation in the future, although the technology tends to be adopted from within the industry. The willingness of firms to innovate is firstly dependent on how they perceive impacts to the workforce, and the cost implications of those impacts:

*“If the products change, then we have to update the training.”*

The survey data provided some examples of how innovation is viewed in terms of the capabilities with the firm’s workforce:

*“There is a skills gap that we have in the business for introducing new technologies.”*

*“We have better staff basically and we have a small turnover of staff.”*

The skills of the workforce however do not necessarily imply that staff have the capacity to incorporate innovation:

*“We are so busy and everything has to run like clockwork. We don’t have time with the training aspect to change the methodology and process and changing people to produce a different manner.”*

*“It would probably be the restrictions to our staff numbers and abilities of our staff to work on new projects and ways of working and on a training basis.”*

## Management

The results further showed that innovation was often reactive to problems or requests rather than proactive opportunity seeking. This emphasis on reacting to the supply chain problems and requests can be viewed in terms of management willingness to innovate:

*“We don’t need to fix something that is not broken.”*

*“It has worked well for so many years, so it is not a problem to be solved.”*

*“Bricks as a product are a dying form of construction and there is a move towards low carbon homes and highly insulated homes which will decimate the brick industry as it stands.”*

Management capabilities are reflected in a foundation industry firm’s approach to planning. Management teams that have put planning practices in place have a more proactive approach to innovation, engaging in medium-longer term visioning exercises and dedicating resources to these goals:

*“Because we try to get it right first time. There is a lot of planning before we go ahead.”*

*“We are a family business and we are not run in the way that bigger organisations are run.”*

Management capacity is seen in the data when some foundation industry firms explain why they haven’t innovated more or devoted more management resources to R&D. Here time is often a factor:

*“I guess we are too busy doing the job to stop to look at how we are doing. We just have a lack of time to reflect on it.”*

## Production

While innovation was frequent and common among many foundation industry firms, some point to the nature of foundation industry activities as limitations on innovation. These characteristics - tradition, proven production techniques, etc. - are commonly cited as undermining willingness to innovate. For example:

*“The products we manufacture, the processing has been well established and it is not the type of product where we can change the production methods.”*

Foundation industry firms often mentioned their production capabilities in terms of competitive advantages, which give insight into which areas of the business may benefit most from innovation. Interestingly, although the quantitative data highlighted that almost all foundation industry SMEs (n=133) see quality and reliability as competitive advantages, qualitative data illustrated that underlying these were deep knowledge and experience:

*“We have a specialised knowledge of processes that give us an advantage over general machinists.”*

*“We have been doing it longer than everyone else and have more experience in the industry.”*

*“Experience of certain employees and we have had people who have been here for 50 years.”*

This highlights the tension between a stable long term way of working, and the capacity to enable this workforce to continue to develop new products, processes and ways of doing business. Time is a major constraint to innovation. R&D and innovation processes require a diversion of resources that is not always possible given existing margins:

*“It goes back to my point of finding the time to implement change and drive change.”*

The findings highlighted that costs are the most common reason for innovation hesitancy. The qualitative data illustrates that costs and time, in terms of production, are strongly linked:

*“Generally it is the cost implication, so the initial start up costs. It is just finding the time to do it.”*

## Technology

A large majority of foundation industry SMEs (n=118) were open to adopting new technologies. Order stability was a common concern for foundation industry SMEs, particularly micro and small enterprises. The way in which they perceive innovation may influence their willingness to adopt new technologies. While some foundation industry firms see new technology as yet another disruption:

*“If you keep changing your processes, all you are doing is interrupting production.”*

A strong foundation in technology was mentioned as a competitive advantage for approximately half the foundation industry SMEs (n=77). A large majority had proactive plans for continuous improvement (n=114), although examples below highlight how these plans may be tempered by costs and reactive to the market:

*“Without introducing new products, we would be standing still as opposed to moving forward and we would run the risk of being overtaken by competitors.”*

*“There is a strive for improvement in the product. The reasons they take place are that they can be paid for.”*

*“To keep it at pace with existing life, we have to keep moving with the times.”*

Technology can also be seen as a way of introducing the capacity required to adapt into the foundation industry firm which may mitigate order instability and changing customer requirements. The ability to adapt technologies to different circumstances, and to retask it as needed to do new things and respond to specific customer requirements, creates a significant innovation advantage:

*“We make products that our competitors cannot. Our technologies have flexibility.”*

## Customers/markets

Finally, foundation industry SMEs referred to customers as their most important source of collaboration for innovation, and a market driven approach to innovation was fairly common. In the foundation industries, the needs of customers are a central driver for willingness to innovate:

*“If we introduce anything new it is usually because the customer asked us to do it.”*

*“If a customer comes up with a new idea, then we have to make it work.”*

Innovation willingness to meet customer needs was often underpinned by a sense of what is happening in the wider market. This both drives innovation:

*“If we don’t innovate, then competitors would steal our business.”*

*“We basically respond to the changes in the market. We need to be keeping up to date with customer needs.”*

*“To keep it moving forward and to keep up with the industry and the world around us. We need to keep up.”*

But a customer centric approach may also hinder innovation:

*“We supply a conservative industry, so we have not wanted to radically change our product.”*

*“We supply and are reactive to the market. What we have doesn’t change much.”*

*“If customers complained we would change more frequently.”*

Foundation industry firm capability to innovate with respect to customers and markets involves developing connections to process feedback and incorporate these into product development and processes. This may involve customer relationship management systems, market research, industry association membership, or other methods of collecting information to inform planning. A customer centric approach, primarily driving innovation willingness, can also lead to improved innovation capabilities:

*“Generally people request from us whether we can make such and such thing. In the early days we had to say no, but people kept asking and now we can say yes.”*

Capacity, in this component, refers to a foundation industry firm’s ability to divert resources from serving the immediate needs of their client base (e.g., delivering the core product or service) to thinking about the future needs of the market. This often also involved trade offs related to time, where either staff or other resources need to be reallocated.

### Scoring

The qualitative responses to the survey were then used to score each foundation industry firm according to the framework, resulting in a dashboard that visualised their innovation readiness in comparison to other respondents (see Figure 4). By applying the tool to a respondent, a discussion about those areas where they are high or low scoring may facilitate awareness of programmes that seek to support foundation industry SMEs in these different areas.

**Figure 4. Comparison dashboard of innovation readiness tool**

	Firm 1	Firm 2	Firm 3	Firm 4
Willingness	2	3	3	3
	1	0	4	2
	1	2	4	2
	2	3	4	0
	1	3	3	3
	0	1	4	2
	2	1	4	2
Capability	3	4	4	4
	1	4	4	4
	0	4	4	4
	1	3	3	3
	1	4	4	4
	4	4	3	2
	4	4	3	0
Capacity	1	3	3	0
	2	1	3	3
	2	0	4	2
	2	1	3	1
	1	4	3	1
	1	2	3	2

Company Component Scores	Firm 1	Firm 2	Firm 3	Firm 4
Customers/Markets	6	10	10	7
Production	4	5	11	9
Workforce	4	9	15	11
Technology	5	14	14	8
Management	13	13	20	9

## 7. CONCLUSION

Previous innovation research focussed on large firms in the foundation industries. We expanded on this by exploring foundation industry SMEs. Foundation industry SMEs demonstrated strong willingness to innovate frequently and most have plans for future innovation. While this trend is encouraging, our data suggests that there are a number of potential areas where willingness (and other categories of readiness) could be improved. Although innovation appears to mostly be adopting changes already demonstrated within the industry. Furthermore, the adoption of new tools, processes, and business practices appears to be geared primarily towards responding to market demand rather than either blue sky R&D or to adapt to regulatory or sustainability pressures. This latter point suggests that there is considerable scope to encourage innovation to improve foundation industry sustainability. Future research might inquire as to what the opportunities might be in this area, although data currently suggests that this might again involve the adoption of more energy efficient technologies versus internally generated innovations.

The innovation capability of foundation industry SMEs is strongly supported by their suppliers and customers, although this appears to limit foundation industry SMEs to reactive changes. This relatively strong connection with suppliers and customers can be a valuable instigator of innovation and suggests that interventions to encourage innovation across the supply chain could potentially enhance performance upstream and downstream. However, it also reveals an interesting gap - foundation industry firms do not as frequently engage with other types of partners such as universities, further education, research organisations, knowledge transfer networks, industry associations, and other government agencies. The question of how these actors could more effectively contribute to foundation industry innovation processes, given the more adoption-related focus of foundation industry firms, is an interesting and important one. Discussions using the guiding framework described above, that highlight avenues for identifying beneficial innovation may elicit a shift in the way foundation industry SMEs approach innovation.

The innovation capacity of micro and small foundation industry enterprises is negatively influenced most by order instability. Cost considerations most often influenced hesitancy to innovate. Where foundation industry firms were hesitant it was also because they were reluctant to divert resources from existing business streams to R&D or other innovation activity. Time was mentioned as a particularly valuable resource. The tool may guide discussions around customers and markets that consider stability of the market, rather than typical discussions limited to market size and fit.

While it is possible to point to the above trends in the aggregate data presented above, it is important to note that foundation industry firm experiences can differ substantially. For instance, the differences in scoring in the four foundation industry firms in Figure 4 show that foundation industry SMEs are rarely strong across the three aspects of innovation readiness or across all five components. Each will have unique challenges and scoring categories and components can help identify areas for improvement and intervention.

## REFERENCES

Chowdhury, J., Hua, Y., Haltas, I., Balta-Ozkanb, N., Matthew, G. and Vargaa, L. (2018). Reducing industrial energy demand in the UK: A review of energy efficiency technologies and energy saving potential in selected sectors. *Renewable and Sustainable Energy Reviews*. 94 1153-1178.

ERC (2021). Innovation Readiness in UK Foundation Industries. February. <https://www.enterpriseresearch.ac.uk/wp-content/uploads/2021/02/ERC-Report-Innovation-Readiness-in-UK-Foundation-Industries.pdf>

Lawrence, M. and Stirling, A. (2016). Strong Foundation Industries: How Improving Conditions for Core Material Producers Could Boost UK Manufacturing. Institute for Public Policy Research. March. [https://www.ippr.org/files/publications/pdf/strong-foundation-industries\\_March2016.pdf](https://www.ippr.org/files/publications/pdf/strong-foundation-industries_March2016.pdf)

ONS (2019a). Employee Jobs by Industry. <https://www.ons.gov.uk/employmentandlabourmarket/peopleinwork/employmentandemployeetypes/datasets/employeejobsbyindustryjobs03>

ONS (2019b). Manufacturing Sector Performance. <https://www.ons.gov.uk/businessindustryandtrade/manufacturingandproductionindustry/articles/manufacturingsectorperformanceuk/2008to2018#the-five-major-negativecontributors>





# Innovation Caucus

# TRANSFORMING FOUNDATION INDUSTRIES: ENGAGING SMES IN INNOVATION

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The Innovation Caucus is funded by:

