Pioneer Project Report

Sustainable and Productive?! Helping Manufacturing SMEs to Manage Multiple Goals

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About PIN

The Productivity Insights Network was established in January 2018 and is funded by the Economic and Social Research Council. As a multi-disciplinary network of social science researchers engaged with public, private, and third sector partners, our aim is to change the tone of the productivity debate in theory and practice. It is led by the University of Sheffield, with co-investigators at Cambridge Econometrics, Cardiff University, Durham University, University of Sunderland, SQW, University of Cambridge, University of Essex, University of Glasgow, University of Leeds and University of Stirling. The support of the funder is acknowledged. The views expressed in this report are those of the authors and do not necessarily represent those of the funders.

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Executive Summary

The productivity of manufacturing firms is critical to the national economy (House of Commons, 2018; McCann & Vorley, 2020). However, tackling climate change is amongst the most significant challenges facing today's (and importantly, tomorrow's) society (IPCC, 2007). Thus, manufacturing companies must identify ways to increase productivity while also transitioning to a low carbon economy (e.g., Bradford & Fraser, 2008). This is a significant challenge for small and medium manufacturing enterprises (mSMEs) given their limited resources. Whilst low carbon SMEs are forging ahead (Conway, 2015), the importance of traditional mSMEs in regional UK centres (Hennick, 2019) means that we cannot let them fall behind in the race to thrive beyond the 2050 Net Zero Greenhouse Gas Emissions target. What if there was a way that organisations could identify the synergies and trade-offs between environmental sustainability and productivity that were implicit and embedded in their firm? How could companies become aware of the interdependencies amongst its environmental sustainability and productivity goals so as to improve their strategic decision-making as to what activities to focus on (start, continue, pause etc.) and when?

Current strategic approaches in mSMEs tend to focus on either productivity *or* sustainability – yet this leaves companies in a quandary when needing to address both. In this project, we recognize that environmental sustainability and productivity are not independent and that working towards one might affect the other. For example, there are some obvious interdependencies between environmental sustainability and productivity, such as when reducing waste can lead to both better environmental outcomes and reduced costs. There are also less obvious interdependencies between them, such as when reducing sales travel to reduce carbon emissions might lead to poorer well-being for the sales staff who must now do all their transactions online. Thus, the interdependencies can be both positive and synergistic (working towards one helps the other) or negative and conflicting (working towards one hinders the other). Yet without being able to map all of the existing goals and interdependencies, companies do not have the strategic information needed to identify initiatives that might reduce tensions or increase synergies.

Hence, we extend current thinking by acknowledging the plurality of a firm's goals and understanding the complexity inherent within those. We show how multiple goals frameworks (e.g., Unsworth & McNeill, 2017) can be used to understand and improve organizational decision-making so mSMEs can reduce environmental emissions and meet government regulations, whilst remaining productive and in business. We do not promote one "best set" of goals but, based on sociotechnical systems (e.g., Clegg, 2016) and goal hierarchy (e.g., Unsworth et al., 2014) theories, we suggest that awareness of the firm's goal configuration is required. That is, if mSMEs are to transition to a low carbon economy then they must be aware of how, and where, their productivity and environmental sustainability goals align (or conflict) and how, or where, they can improve alignment.

We conducted two workshop webinars with 237 registered participants, five interviews and multiple team members all analysed archival data of 19 organisations. Through this corpus of data we were able to develop a new analytical tool, Organisational Goal Hierarchy (OGH). Our initial reliability and validity evidence suggests that the OGH tool allows senior managers to map their firm's goals and identify possible initiatives that will promote more strategic

sustainability - whether that be creating new, or removing existing, goals or identifying connections between goals to justify why something is being done.

Aside from the design and validation of a new tool that can be used in practice, the tool also highlighted implications for research. The analysis of OGHs through archival data allowed us to identify patterns in the ways in which mSMEs were juggling environmental sustainability with productivity goals. We identified two "types" of mSMEs – traditional mSMEs who were considering environmental sustainability alongside their core purpose, and environmentally driven mSMEs who viewed sustainability as a core element of their company. Environmentally driven mSMEs know why they are trying to reduce their carbon footprint, water use and so forth, and it was often a unique selling point that differentiated them from competitors. For traditional mSMEs, however, it appears that there is little thought given as to why they are trying to be environmentally sustainable, other than the incoming regulations, and how taking on the challenge fits with their other higher-order goals. Hence their focus so far seems to be more on *how* to implement environmental sustainability rather than on *why* they should become sustainable. In turn we posit that this is currently reducing their solutions for reducing environment emissions (i.e., when we consider *what* their goals are). We do not advocate that traditional mSMEs must become environmentally-driven (i.e., focusing on environmental goals at the forefront of all else), however we believe that a greater focus on linking environmental sustainability to their core purposes will have long-term benefit for both productivity and sustainability.

Throughout this study, it was clear that understanding ways of overcoming the tension between environmental sustainability and productivity is very important to a lot of mSMEs going forwards. Given that UK-listed companies will soon be required by the UK's Financial Conduct Authority to produce mandatory climate risk disclosures, it is likely that mSMEs within these supply chains will also need to produce similar disclosures during tendering. Thus, on top of the strong desire that already exists, the compliance and regulatory goals that will emerge from the Financial Conduct Authority will lead to an even greater necessity to help traditional mSMEs juggle these goals. We strongly recommend that more attention is directed to this complex problem to help companies survive and thrive in a low carbon economy.

Background & Theoretical Development

Goals for Manufacturing Organizations

Manufacturing is essential to the national economy – it accounts for £177 billion of the UK's economic output (10% of total) and employs approximately 2.7 million people, with over half of these employed in small and medium enterprises (Statista, 2018). Hence, manufacturing needs to be as productive as possible. Organisational productivity is when organisations increase the quantity or quality of output, despite using the same number of resources (Ruostela et al., 2015) (i.e., it is about achieving more with the same), and is considered a "wicked problem" because managers must constantly juggle a myriad of sub-goals within the pursuit. Furthermore, scholars attribute the stalling of productivity gains in the industry to leadership having not been updated alongside technology and AI gains (e.g., Clegg, 2016; Clegg & Davis, 2016). Barriers to an organization's productivity gains not only reside within the organising and management of sub-goals within the broader goal of productivity itself, and how solutions are embedded in the workplace, but also from the mere fact an organization is striving to simultaneously achieve other broad level goals.

One of these "other" goals is environmental sustainability. The UK government pledged that the economy would reach net zero greenhouse gas emissions by 2050. Therefore, the transition to a low carbon economy means manufacturing organizations must now also juggle and or manage an organizational environmental sustainability goal.

Another reason why it is particularly important to best know how to handle both productivity and environmental sustainability goals within the context of mSMEs specifically is because they are hardest hit by this plethora of goals: often they do not have spare resource (Hennick, 2019), are carbon "heavy" (Eurostat, 2019) and have stalled productivity (House of Commons, 2018). Goal conflicts between environmental sustainability and productivity are also more likely to occur in regions with lower innovation and poorer infrastructure (akin to the regional innovation paradox; Huggins, 2018). For example, regions with high innovation can create positive spill-overs (e.g., new processes and technology can work towards both productivity and environmental sustainability) but in others there may be negative interdependencies (e.g., poor regional infrastructure means that quality suppliers must be sourced at long distances, increasing carbon emissions).

Despite research on traditional firms typically focusing on productivity (e.g., Cook et al., 2019) in isolation from environmental sustainability (e.g., Bradford & Fraser, 2008; Ghisetti et al., 2017), we do not see them as independent (e.g., Davis et al., 2014). Some of these interdependences are more obvious (e.g., reducing waste) than others (e.g., sales travel, well-being); some interdependencies are negative (e.g., local suppliers might increase costs) while others are positive (e.g., local suppliers might increase the company's reputation for reliability). However, given their complexity and embeddedness, most firms have little explicit understanding of what these interdependencies are. What if there was a way that organisations could work towards both sustainability of our environment and its own productivity in a way where each goal did not hinder (i.e., is neutral for) the other? What if they could identify initiatives that could develop synergies for both environmental sustainability and productivity? How could companies become aware of the interdependencies amongst its

environmental sustainability and productivity goals so as to in turn be able to improve their strategic decision-making?

In dealing with the climate crisis, therefore, we recognize the complexity of the goals inherent in mSMEs and suggest that outcomes will be better when a firm is able to articulate and explicitly address the interdependencies among those goals. Given the need to address this complexity alongside a need to use a simple tool that can be easily understood by firms (see Clegg, 2016) we propose a goal hierarchy approach to understand ways in which the multiple goals, both productivity and sustainability, can be addressed.

Goal Hierarchy Theory and Organizational Goal Hierarchies

Goal hierarchy theory within organizations (Cropanzano et al., 1993; Unsworth et al., 2014) is based on social and cognitive psychological theories of goal systems at the individual level (Kruglanski et al., 2002). In this literature, behaviours are goal-driven (whether they be conscious or sub-conscious goals) and goals exist at various levels of abstraction from abstract values and identities through mid-range project goals to detailed, day-to-day task goals (Austin & Vancouver, 1996). At any level of abstraction, the goals can be in different work domains such as engineer, quality, safety, performance as well as personal domains such as mother, respect, and work/life balance (see Figure 1). Not only are goals represented in a pattern relative to one another, the GH framework also includes connections between goals which symbolises whether a goal facilitates or impedes another (e.g., Lord & Hanges, 1987). A facilitative connection ensures that when one goal is salient, the others to which it is connected will also be made salient and that the achievement of one helps the other. Note, this facilitation can either be instrumentally as a subcomponent of the higher-order goal, or cognitively as an awareness and motivational impetus. An inhibitive connection means that when one goal is salient, the others to which it is connected are actively forgotten and the focal goal is shielded (Shah et al., 2002). When goals are not connected, there are holes in the connectionist architecture potentially leading to a loss of motivation. An example can help to illustrate these three types of connections. For example, an employee might perceive that a task of recycling in the office has a positive, facilitative connection with their identity of 'being green', a negative, inhibitive effect on their value of 'an easy life', and no connections to their mid-range goal of customer service.

At the individual level, organisational research has shown that the content of the goals, their perceived importance, and the connections between goals within and across hierarchical levels, affect pro-environmental behaviour (Unsworth & McNeill, 2017), motivation (Molina et al., 2013), perceptions (Cropanzano et al., 1993), intentions (Unsworth et al., 2013), and schemas (Adriasola et al., 2011). We believe that a similar framework for goals would also exist at the organisational-level – an organisational goal hierarchy (OGH; see Figure 1 for a simplified example of a fictional university). We suggest an OGH would have company values and vision at the most abstract levels, followed by long-term strategic goals and other mid-range goals, with specific objectives and key performance indicators at the most concrete level. Similar to the individual-based goal hierarchy, we propose that there would be both productivity and environmental sustainability goals located at different levels and both positive and negative connections amongst these goals that would lead to firm performance. The goals can be aligned either horizontally (i.e., within the same level of goal abstraction), such as when

increasing R&D helps to increase quality, or vertically (i.e., across levels), such as when focusing on both environmental sustainability and quality both improve financial performance.

Of course, multiple goals have been studied in organisations previously. This has generally focused on either multiple specified goals at one particular level (e.g., triple bottom line or hybrid organising) or a top-down cascade of goals (e.g., management by objectives). While both of these have merits, we believe they each miss important implications that could only be understood by an OGH approach. For example, by thinking only about one level, we will miss the ways in which more concrete goals may facilitate or impede each of these goals; but by thinking about how an abstract goal cascades down throughout the organisation, we will miss the unintended consequences on other goals as well as missing bottom-up activations.

This project will therefore use the OGH concept as a lens to analyse productivity and sustainability-related goals of UK mSMEs. Similar to hybrid organizing (e.g., Battilana & Lee, 2014), we will uncover trade-offs, negotiations, and alignments between sustainability and productivity but we will do so across various levels of abstraction. Similar to management by objectives, we will uncover how sustainability goals are implemented in mSMEs but we will also explore how they interrelate with productivity goals as well as how they are connected to organisational values and vision. Our approach is business-centred in that we are not advocating particular goals but rather goal management within unique contexts.

Based on psychological (e.g., Kruglanski et al., 2002) and sociotechnical (e.g., Davis et al., 2014) we suggest that clarity of goals and their interrelatedness is key to goal achievement. The granular, interdependency-based understanding from OGH enables implementation beyond strategy plans and triple-bottom-line; for example, an SME might have a sustainability value but are unaware working towards another goal might be impeding it through knock-on effects and interdependencies amongst goals. We propose that overall benefits accrue only when goals are managed across multiple domains and not on productivity alone.
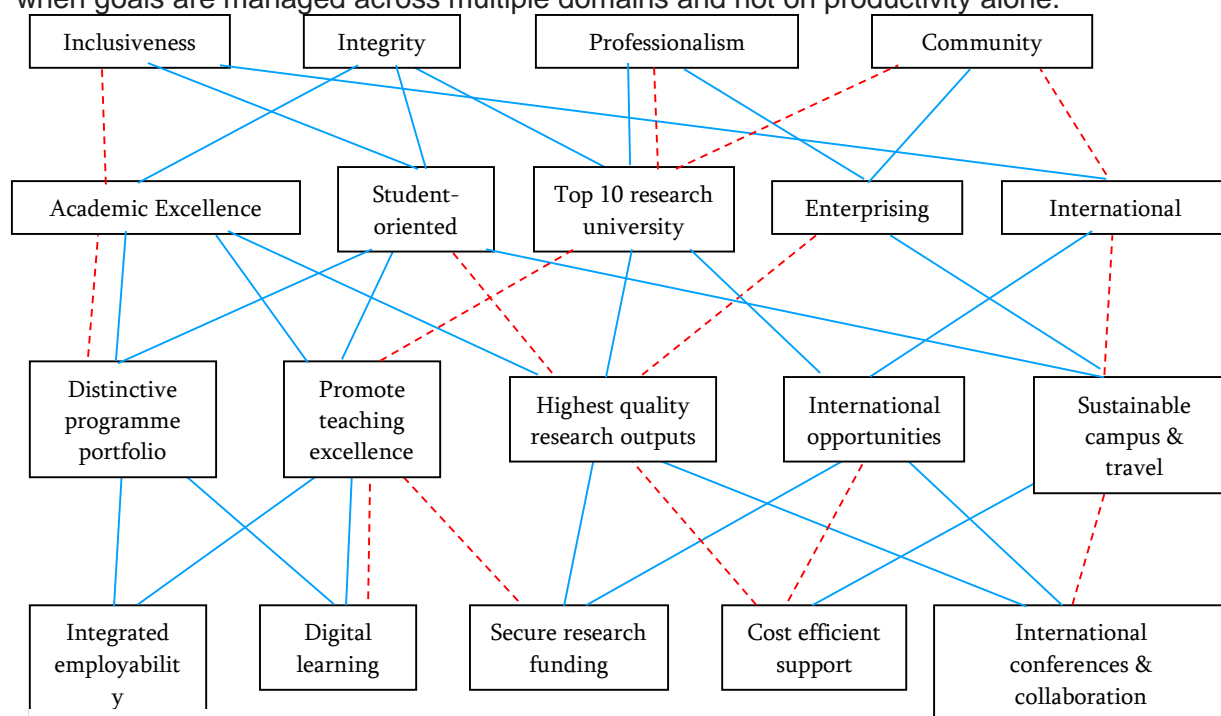

Figure 1. Simplified OGH of a Fictional University

Methods

Our study began in the spring of 2020, when the UK was in a national lockdown due to the coronavirus pandemic. This meant that we had to change our methodology as we could no longer hold face-to-face workshops or interviews. More importantly, the entire economy was in trouble and many SMEs were facing urgent operational changes at best, and demise at worst. It is therefore understandable that senior managers of mSMEs did not want to spend their time participating in research projects and we felt it unethical to pursue them during this stressful period. Instead, we changed our approach to focus on: 1) short workshop-webinars that allowed us to provide knowledge to the mSME community as well as developing our knowledge of the phenomena; 2) interviews with relevant stakeholders involved in mSME environmental sustainability where possible; and 3) analysis of archival data.

Workshop Webinars

The aim of the workshops was to engage in a co-creation of understanding the issues of mSMEs in juggling sustainability and productivity. We conducted two workshop webinars: one in August and one in October. 184 people registered for the first webinar and 53 people registered for the second. Unfortunately, there is no way of telling how many of those actually attended as delegates do not need to "check in" when they join the meeting. Participants included University of Leeds staff and students/alumni (65%) and external guests from industry (35%) such as SME's and policy makers.

The first workshop webinar was based on two industry speakers, a panel discussion and a broader Q&A session with participants. Tracy Dawson, Managing Director of an mSME (Daletech Electronics) and Chair of the Leeds Manufacturing Alliance, and Mike Rimmer, Operations Director of an mSME (Brandon Medical), spoke about the ways their companies are both productive and sustainable and the challenges they face in being productive and sustainable.

The second workshop webinar was based on one specific company, Agfa Graphics Ltd and included an industry speaker, a presentation from the project team and a broader Q&A session with participants. Graham Cooper, Operations Director, spoke about how the Leeds plant of Agfa had progressed towards being both productive and sustainable. The project team presented an OGH of the Leeds plant at Agfa and showed why their current approach was successful and how they could achieve more synergies.

Interviews

The aim of the interviews was to get more in-depth information on the specific issues for each organisation. We advertised recruitment for our project for over 3 months (30/7/2020 to 7/10/2020) to over 50 sources via direct email, zoom calls, social media, webinars/workshops and podcasts. However, as noted earlier, we recognised the stressful situation that many mSMEs were in during our period of data collection and thus, if we did not hear from a company after the initial contact, we did not pressure them with follow-up contacts.

We conducted five online interviews with different stakeholders. Three of these were with mSMEs, one with a small site of a multinational organisation, and one with the Chamber of

Commerce. Two of the mSME interviews were based on developing an OGH for each company; the remainder of the interviews covered questions to understand company values, goals and day-to day activities. As well as how these connect in relation to sustainability and productivity (i.e. how their goals interact, help or hinder sustainability/productivity). A diagram of the Positive Impact Commerce System was shown to each participant to aid conversation around types of goals.

Archival Data Collection

We used annual reports, sustainability reports and website information to develop OGHs. We started by gathering company information using FAME (Financial Analysis Made Easy). As small companies generally do not need to conduct or publish these reports, we extended our filter to including firms with up to 500 employees. We filtered for companies based in the United Kingdom and only those whose industry classification key word was "manufacture/manufacturing". We worked through the list in the order presented and for each firm, we searched Companies House and sustainability databases for those companies that had a publicly available sustainability report and annual report. For this project, we used 15 companies from FAME that met our criteria and we identified four more companies that met the criteria through our networks or online. The types of manufacturing included:

- The manufacture of injection moulded dispensing closures.
- The manufacture of wood, furniture & paper
- The manufacture of children's and baby food.
- The manufacture of office filing and furniture systems.
- The manufacture of food
- The manufacture of prepared pet foods
- The manufacture of building blocks.
- The manufacture of greetings cards.
- The manufacture of children's and baby food.
- The manufacture of seamless steel high pressure gas cylinders and provision of related testing/cleaning services.
- The manufacture of herbal teas and remedies.
- The manufacture of plastic & paperboard packaging
- The manufacture of aluminium windows and doors.
- The manufacture of stern shaft seals
- The manufacture of integrated hydrogen energy solutions
- The manufacture of specialist lighting and hospital equipment
- The manufacture of fabricated metal products
- The manufacture of prepared meals and dishes

Results

The tension between productivity and sustainability appears to be an issue that is of interest to many as evidenced by high numbers of industry attendees at the webinars. The first implication from this research therefore is that there is a clear need for more research into this phenomenon and a strong case for impact where changes can be made.

Innovative Methodology

As noted earlier, the pandemic meant that we needed to change our methodology to one which could be achieved with minimal intrusion on senior managers of mSMEs; we therefore developed a new analytical method of capturing OGHs from archival data. First, one mSME annual report was coded independently by the PI and two research assistants; we discussed the different approaches taken, the commonalities, and the differences in the resulting OGHs. The overall content was the same, but the level of detail differed, therefore we agreed on three levels of coding with increasing abstraction (these are detailed later; reports chosen for each level were selected randomly). Following this, five reports were coded independently by the two research assistants with cross-checking for reliability after each one. Discussions took place to identify how and why interpretations were made and these were recorded as the specifics of the analytical methodology developed. Thus, we have evidence of the reliability of the technique.

Two of these OGHs were then discussed with senior managers of mSMEs during their interviews. They indicated that our OGHs were appropriate and although they were able to flesh out some of the specific content, the thematic interpretations did not change. This provides initial evidence for the validity of the technique even though it is based only on publicly available (and thus, potentially censored and/or socially desirable) data. OGHs were then developed for each company by RAs individually.

The most detailed form of OGH was created by coding the archival data and noting both the company's goals and the phrases or elements of that data that indicated the connections. Each sentence in the archival data was analysed and we were looking for words or phrases that described the organisation's goals, values, identities or tasks as well as the explicit phrases that signalled connections between the goals. See Figure 2 overleaf for one of the OGHs showing the linked coding.
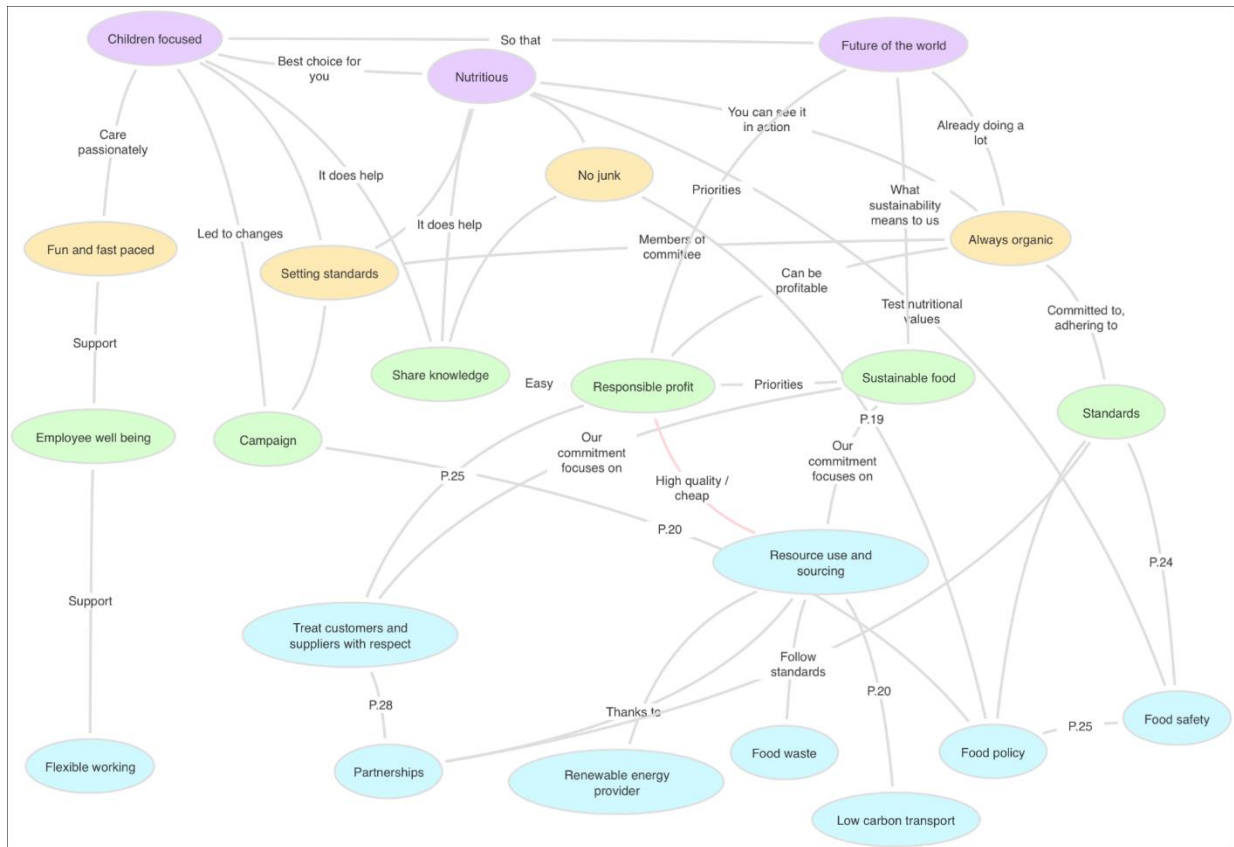
Figure 2. Detailed, explicit link OGH of an mSME

The next level of analysis included a lot of goal content, but the linking was abstracted. As before, each sentence in the data was assessed and specific values, identities, goals and tasks ascertained, but we did not include the specific linking phrases in the analysis. See Figure 3.
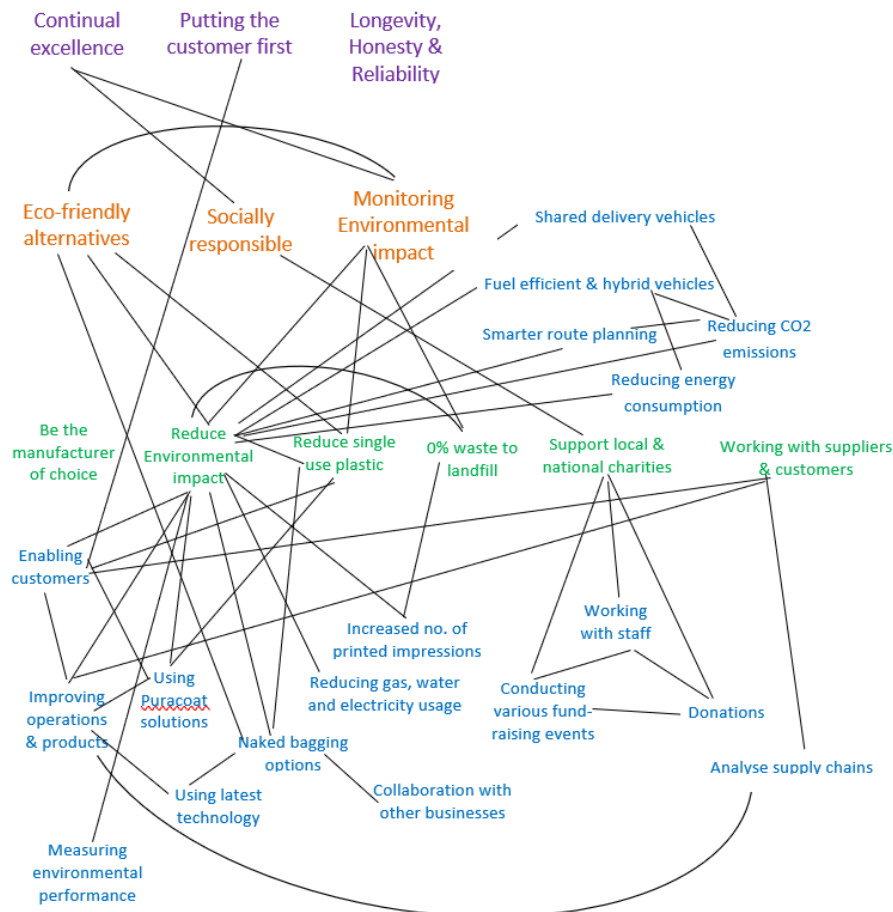

Figure 3. Detailed analysis of an mSME's OGH

Themed coding reports (see Figure 4 for an example) were assessed in detail, again reading carefully and addressing each sentence in the archival data, but then analysed holistically, reading through reports and capturing overarching, values, goals, identities and categories of tasks, For example coding 'supporting suppliers' rather than specific examples provided such as 'encouraging farmers to brace natural techniques, 'installing a new drip integration system in India'. If several tasks were linked to the same goal for example, but were not paraphrased in a report, these codes would be grouped into the same node. For example, 'National lectures', 'conference' and 'events' may be written in separate sections of a report but all link to the goal of 'promoting wellbeing'. Codes were also made based on degree of focus – headings and subheadings were more often coded than specific details provided in the main content. This technique was applied to allow better comparison between OGHs. It was also used if there was no access to an annual report and information was gathered from company websites.
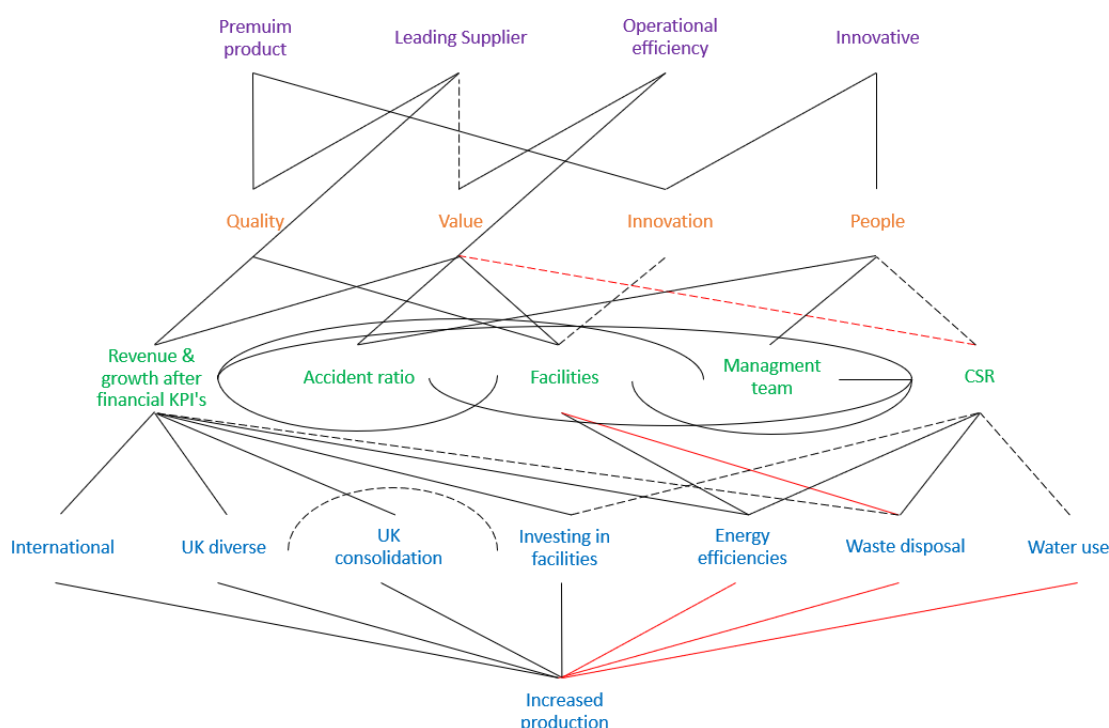

Figure 4. Themed analysis of an mSME's OGH

Our revised methods meant that we were reliant on archival and documentary evidence that could be used to develop OGHs. As most traditional mSMEs do not need to (nor want to) create high levels of archival evidence, we found that we had essentially two categories of mSMEs. The first were the traditional mSMEs which tended towards the larger end of the spectrum. These companies were across a range of industries and environmental sustainability may have been important, but it was not central. The second category of mSMEs we found were those who had built their company around the central proposition of environmental sustainability. Again, they varied across a number of industries, but environmental sustainability was core, regardless.

How do traditional mSMEs currently approach dealing with the two goals?

Environmental sustainability in traditional mSMEs is often viewed at the more practical levels. Even those companies who are keen to be environmentally sustainable and to reduce their carbon emissions seem to focus on "how" to achieve this – that is, the focus of their thinking and decision making often seems to be on the implementation. This can be evidenced in the OGH presented in Figure 5 of a medical technology mSME. For this company, environmental sustainability was focused on having a policy and meeting international standards. Although they saw this as helping them to be a market leader, they did not see connections to their organisational values of being ethical and trustworthy, nor to their strong regional (place-based) identity.

> *"we are an ethical company and we want to help the environment…we make evert effort to make products that are recyclable and long lasting…we are designing in sustainability…in our goals in terms of sustainability we mark it clearly in the design plan…our design philosophy is to design for clean, environmental friendly, conscious manufacturing set up"*

> *"part of our ethos we have got ISO2001 2016. We deliberately went for that to show our customers that we are environmentally savvy and we are aware"*
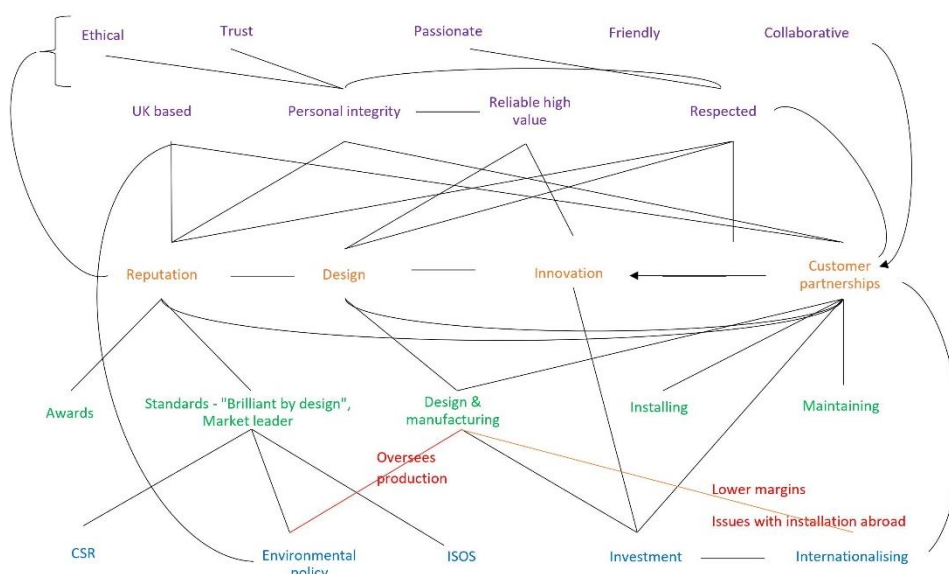

Figure 5. OGH of an mSME in medical manufacturing

Given this focus on implementation, it is not surprising, therefore, that many SMEs believe in the value of technology to monitor and measure productivity and thus sustainability. That is, monitoring machine efficiency will help to improve productivity and more efficient energy use.

> *"we are looking at smart processes which can cut down on labour costs and labour time…we just put in what we call a smart cell…so we no longer need someone to cross check quality…we have sped up production time and reduced labour cost element that allows us to drop the price"*

Following our webinars we had requests for help, not for strategic decision-making, but for technology, namely carbon calculators. We believe that this focus on implementing environmental sustainability and having the right tools neglects the higher-order tensions and trade-offs that can emerge. Even when companies aim to find a technology that is a win-win for both goals, it still does not take the broader strategic picture into account.

A common tension we found in the interviews and workshops was, not surprisingly, around financial goals. For example, there was a long discussion over re-shoring (buying from local suppliers instead of cheaper international suppliers) and the conflict between relocating to UK to reduce carbon footprint but thus paying more to make products/not having all the resources.

> *"…planned to outsource it to a supplier in Taiwan...per chance a machinery company in US shipped a batch to UK…It allowed us to bring everything we were going to machine, in Taiwan with all the carbon footprint, in house which reduces stock we need to hold, reduces running time, makes it more agile. We have onshored and now we've got an appetite to onshore more. We reduced our carbon footprint. There's a cost on that as well…but if you factor in shipping costs and carbon costs you often justify the extra expense"*

Top-down sustainability driven by managerial decision-making is more apparent than bottom-up driven by employee suggestions. Nonetheless, we recognise that this could be due to the methodology in that we are talking to the owner-managers and reading annual reports which would want to promote the view that "the top" is doing all it can. When asked, managers provided examples of younger generations outside the workplace (e.g., children or grandchildren) asking the managers what they do for the environment – *"they've all got either kids or grandkids and they're coming home from school saying, what do you do about sustainability? The kids are putting pressure on the parents and grandparents and so they were really pleased when it came up as a topic [at work]"*. They also discussed instances of employees taking the initiative to create pro-environmental behaviour change across the organisation (recycling/waste management) *"a maintenance mechanic, he decided to get involved…he took it on himself to separate out all the materials…and we found that with separate materials we no longer had to send it to landfill, someone would be willing to take it."* . Nonetheless, in each of these instances, the suggestions and prompting fit within the existing OGH did not challenge assumptions either in the goals themselves or the connections between the goals. Instead, they were focused, again, on 'how' the goals could be implemented and resulted in new concrete level goals rather than changing the higher-level goal pattern.

How do sustainability mSMEs deal with the two goals?

We found a second type of mSME which put environmental sustainability front and centre (see Figure 6). For these companies, environmental sustainability was a high-level abstract goal but was positively connected to other high-level abstract goals, namely performance and productivity goals. These companies view environmental sustainability as a unique selling point. Some companies recognised the tension in "responsible profit" between productivity and environmental sustainability, however, more often than not the productivity and profit-related

higher-level goals tended to be less strongly connected within the OGH than the sustainability goals.
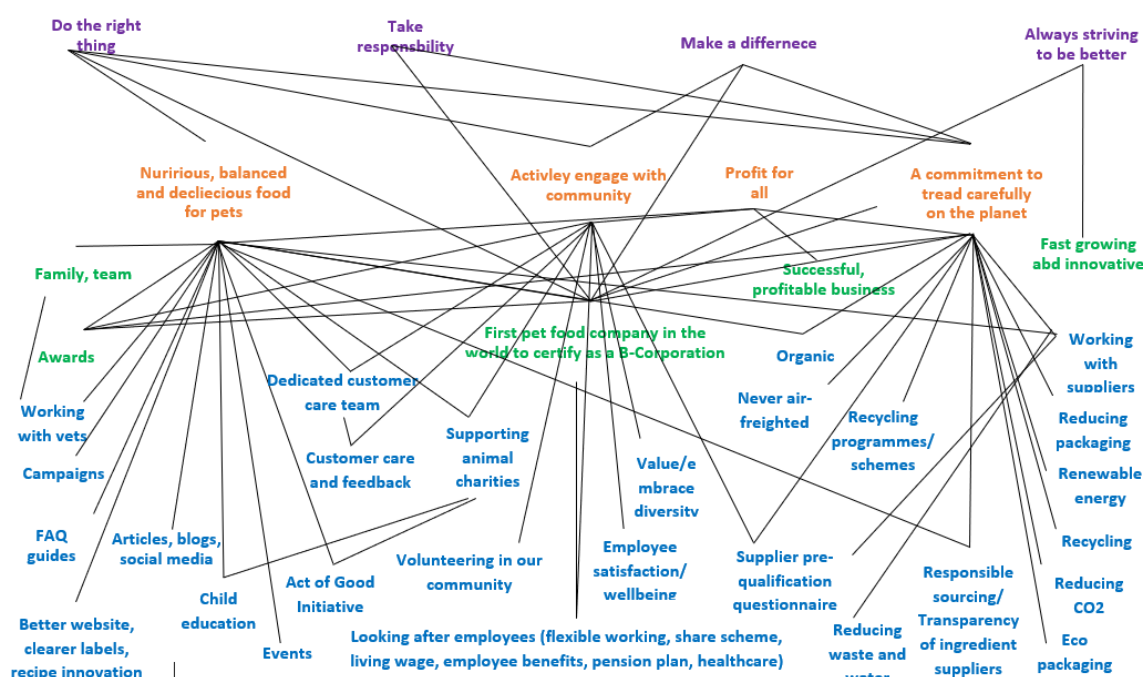

Figure 6. OGH of a Sustainability-Driven mSME

Making a difference – focusing on 'how' not 'why'
We can see a clear difference between these two "types" of mSMEs based on the abstract/concrete nature and embeddedness of the environmental sustainability goals: The latter have more abstract and embedded sustainability goals while the former have more concrete and separated sustainability goals. For the traditional mSMEs, the importance of designing sustainability into processes from the outset was recognised however this was perceived as designing sustainability "into" the processes rather than "redesigning" the design. For most of our traditional mSMEs, there was little evidence of sustainability being linked to other organisational goals such as quality, value, customer markets, etc. Instead, environmental sustainability tended to be a lower-level goal with high equifinality (many ways of implementing it) but low multifinality (few connections to higher-order goals).

Due to this, we found that many of the actions taken by mSMEs are based on quick wins or "low-hanging fruit". For example, one interviewee focused on recycling.

> *"From a business perspective there's got to be a business case – ROI or cost savings. Thought about having an EV point for client convenience but there's no point."*

The tension with greenwashing
Interestingly, there were indications that companies were very concerned about appearing to be 'greenwashing' (e.g., Lyon & Montgomery, 2015). Linking environmental sustainability goals to a company's more traditional goals, such as reputation or market share, was viewed cynically in both the workshops and interviews. Indeed, comments in the webinars suggested

that sustainability attempts are dismissed if they're not done with the right motive, in the right way, as greenwashing - *"for some businesses, environmental sustainability is a tick box exercise at present."* This suggests that there seems to be those who hold all-or-nothing views of sustainability – that an mSME is either an environmentally-driven mSME or a non-environmental mSME.

Not just productivity – other goals & priorities

Of course, the timing of the research also highlighted the multiplicity of goals that mSMEs are juggling at the moment. The combined effects of environmental sustainability with the pandemic were raised during the webinar discussions and included issues such as recycling PPE and raising opportunities for public sector procurement.

> *"we have seen through the pandemic the weight of innovation and creativity which exists in our region, in particular around pivoting production to PPE. Many SMEs have struggled to supply big public sector [in the past]. Is there now an opportunity to make public procurement more SME friendly and avoid long and environmentally damaging supply chains?"*

> *"do we recycle, burn or landfill masks visors etc, you can set up as many processes as you like but individuals choose which bin to put it in!"*

> *"PPE recycle is a practical issue"*

Finally, other future concerns (predominantly Brexit and automation) were also raised, both as issues for mSMEs in their own right and also what the combination of these with environmental sustainability will mean for mSMEs.

Implications for Research into mSME Environmental Sustainability

This project has highlighted the importance of understanding how environmental sustainability fits with a firm's other goals. Theoretically, we have very little complex understanding of the way in which multiple goals operate within organizations – what we do know is simplified either to a vertical cascade of goals (e.g., managing by objectives) or to looking at a limited number of goals on one level of abstraction (e.g., triple bottom line, hybrid organising). Our approach combines both of these as well as allowing for bottom-up activation.

Our OGH approach represents a complex system and thus we are not trying to find one "best practice" OGH. The complexity means that there will always be a degree of emergence and unpredictability involved, and we recognise that it is a part of an open system that will be affected by external elements. We focus here on awareness of the OGH. Rather than *reacting* to the tension between productivity and sustainability the OGH allows firms to *prevent* these problems or *proactively design* synergies between them in the first place.

Moreover, we have shown that a focus on more concrete sustainability goals and connections might be limiting the more radical change needed to achieve net zero carbon emissions. We theorise that the OGH not only allows us to understand goal interdependence across multiple and mixed levels of analysis but also provides insight into determining which goals will be

allocated resources (and thus be more likely to succeed) and which will not. If environmental sustainability actions and goals are not positively connected with the organisation's higher-order goals then they are less likely to be allocated resources. The OGH therefore has provided a crucial insight that may would not have been captured through previous conceptualizations.

Nonetheless, the complexity of the OGH approach has meant that we needed to develop a new methodology. The contextual constraints caused by the coronavirus pandemic meant that we were not able to conduct the focus group workshops, nor were we able to recruit many mSME managers. However, our use of archival data to develop OGHs appears to be trustworthy. Interestingly, the term 'hierarchy' which comes from the social and cognitive psychological fields creates certain connotations in the organizational setting. Indeed, when we examine our OGHs and the theorising that sits behind them, we are conceptualising an organisational goal network rather than a top-down, cascading hierarchy. More work needs to examine whether the connotation that might be held by policy-makers and company managers of a hierarchy leads them to disregard the usefulness of the OGH approach.

Finally, although we struggled to recruit participants for interviews, we did not have problems in engaging mSMEs more broadly in the project. We have begun to form an mSME community interested in environmental sustainability and through the online seminars, blogs, and podcasts we can see the desire for answers to this dilemma. As our results, and our case study, show there is no easy answer to how mSMEs can be both productive and environmentally sustainable, but we believe that complex research will be able to tackle this complex question.

Conclusions & Next Steps

In sum, the key learnings and recommendations for policy-makers, managers and researchers that emerge from this project are:

1. The tension between environmental sustainability and productivity is very important to a lot of mSMEs. We strongly recommend that more attention is directed to this complex problem to help companies survive and thrive in a low carbon economy.

2. Moving beyond 'how' to 'why'. Environmentally-driven mSMEs know why they are trying to reduce their carbon footprint, water use and so forth – it is often a unique selling point that differentiates them from competitors. For traditional mSMEs, however, it appears that there is little thought given as to why they are trying to be environmentally sustainable and how it fits with their other higher-order goals. The focus so far seems to be more on how to implement environmental sustainability rather than on why they should become sustainable. We are not trying to suggest that traditional mSMEs need to become environmentally-driven, however we believe that a greater focus on linking environmental sustainability to their core purposes will have long-term benefit for both productivity and sustainability.

3. The UK's Financial Conduct Authority's recently announced that UK listed companies will be required to produce mandatory climate risk disclosures by 2025, providing clear information regarding the business' climate related risks. While the proposals cover the

UK's largest firms, experience from areas such as anti-bribery and corruption, as well as modern slavery reporting, suggests that requirements for disclosure often gets cascaded up supply chains and becomes a component of due diligence or tendering. This is significant as our research demonstrates the importance of meeting customer oriented goals and compliance/regulatory goals within mSMEs OGHs and the potential for this to address the low multifinality with sustainability that we identified. The requirement for large firms to disclose climate related risk will necessitate the flow of information through supply networks and chains to enable large companies to calculate their risks and impacts – for mSMEs the activity of measuring and calculating environmental impact may both make this issue more salient, normalise reporting and provide tangible data for feedback and progress against environmental goals.

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Appendix – Teaching Case Study

Inspired to Be the Best: A Case of Agfa Leeds Factory

Mr. Graham Cooper is Agfa Graphics Production Operations Manager and Plant Manager, responsible for the high-tech printing products manufacturing at Leeds. As an expert in the lithographic plate manufacturing field, Mr. Cooper is a senior research scientist for Vickers Howson-Algraphy & production technical Support and management for DuPont. He emphasizes contributing to the community and society, and now he is in the governing body of UTC Leeds and plays a leading role in the Leeds Manufacturing Festival organisation.

Agfa Leeds has won first prize in a national MX Arup Award competition from the prestigious Institute of Mechanical Engineers (IMechE) in the UK in 2007 and other national awards for sustainable manufacturing. It has developed a fully integrated management system.

The headquarter of Agfa launched a worldwide "sustainability and energy education program". Mr. Cooper was appointed as the manager of the program since the Leeds factory was the best. Mr. Cooper has been sharing presentations with subsidiaries of Agfa group, driving sustainability and energy reduction programs around the world. At least 50 million euros of Agfa annual cost get saved by spreading best practices throughout all the plants.

Agfa Leeds production plant innovated a novel approach to reduce the amount of acidic waste produced in the process of aluminium plates printing, and replaced by a more easily soluble waste and cleaner results, which significantly improved the treatment of waste by 98.5%, virtually eliminating landfill. They demonstrated that they are environmental responsible citizens, in the process of providing industry-leading products and services.

Back in Year 2005, Agfa Leeds site landfill was 5,850 tonnes, but the company strived to achieve zero general waste to landfill since June 2010. It has been a huge change and how could they achieve this?

Agfa Leeds plant first conducted analysis of the waste, and found out that the wastes include polythene, banding, banding spools, and coil wrapping. These are common materials that they were sending to the landfill in 2007 and maybe they could actually do something about.

The white coil wrapping, could not be recycled because it was a composite material. However, this coil supplier is in the UK and the coils are delivered in covered wagons. So Agfa talked with their suppliers to make changes. Coils from this supplier are now delivered without wrapping to ensure sustainability, reducing 3 tonnes per annum reduction of landfill. Another material in the waste was the wrapping from other suppliers, these coils are shipped to Leeds from mainland Europe and the wrapping is required. However by purchasing a baler, they can recycle this material. The bales of the coil wrapping material are now sold and they create a revenue stream, resulting in an estimate of 6 tonnes per annum removed from landfill. At the same time, they dramatically reduced packing waste, and achieved an annual saving of 9 tonnes plastic and £20,000 cost.

Digitalization in daily operation helps the Agfa Leeds site to achieve accurate measurement of gas, electricity, and water usage. For example, by adding run meters to space heaters, Agfa Leeds plants could automatically collect data and could turn down stats and reset timers. This was part of a bigger study to completely understand everywhere they were using hot water for heating and how much in each area (production area, offices, or warehouse area). Similarly, through analysis of heating and cooling, Agfa tackled the problems of overheating in early winter and overcooling in summer. As shown in the data, the proportion of annual none productive energy (NPE) in the plant has dropped from 25% in Year 2011 to 2% in Year 2016.

Literally there are thousands of digital input and outputs from the plant operation process, and the Agfa people review these remotely, understanding what is going on. Every weekday morning, they review what's happened in the previous 24 hours, and exactly which machines run out, and the amount of downtime that the machines had. A quality instant reporting system reports quality, safety, environmental and energy incidents, benchmarking with ISO9001, etc. They will get to the root of causes and generate action plans to prevent the incident to happen again. These action plans are periodically reviewed and we focus on the important action trackers instead of mechanically following the sequences/dates of incidents included in the system.

Agfa Leeds plant managed to merge the roles and responsibilities in order to have an integrated view of sustainability. So they got a safety, health and environmental specialist. And at the same time, every line manager in the plant is responsible for health and safety, for quality, for environmental performance and for local costs. The transformed organizational structure facilitates sustainability management and knowledge sharing.

Fighting to Survive

Why Agfa at Leeds is so motivated to promote sustainability and productivity? This is a story of survival. Due to the declining industry and dramatic technology updates, the headquarter of Agfa had thought of closing the Leeds factory down by 2007. The big competitors are Kodak and Fuji. The competition is all about cost, quality, and new technology. So the local management team at Leeds decided that they aim to become the best factory.

"So we've survived a good on the map. And part of the way I did that locally, we decided the local management team, that we would aim to become the best factory, and it's harder for them to close down their best factory. So we started independently of headquarters to try and drive best practice improvements, part of which was sustainability, because we're using lots of energy, lots of electricity, lots of aggressive chemicals in the process. If you use those more efficiently, you save a lot of money so we could drop our production costs, which I guess is way going into the productivity by being more sustainable. So we set local goals to best practice and drove a sustainability agenda as part of it. So I forget the exact question that you asked, but our overall goal is to be the best we call it on site and what that means, the best factory with an extra."

In Year 2005, the new management team settle this goal to be the best company and communicate that across all the workforce. Mr. Cooper personally spoke to the workforce in small groups of eight or nine people multiple times to tell them what they are trying to do and why and explain it. In the employee attitudes survey, the management team was surprised that employees got a consensus and strongly agreed with the statement of "I am inspired by the thought of being the best".

"When we got the results of that (survey) back, it was really quite surprising. Almost everybody in the company strongly agreed they were inspired by the thought of being the best. So. I mean, it's look, it wasn't a skillful pick, but however we communicated and picked it."

Engagement and Everyone on Board

Agfa transformed the effluent treatment process, and successfully shifted from sending about 7,000 tones a year to landfill to 90 tons, and finally zero waste to landfill. In the process, many employees participated in the improvement projects. The message of everybody needs to involve in innovation and sustainability go directly to the factory. Why people consider this as a topic and happy to get involved?

"And the sort of prevailing reaction we got was, oh, it's about time people were sort of waiting for. It was surprising. We said, why is it that they've all got either kids or grandkids and they're coming home from school saying, what do you do about sustainability and waste? And the kids are putting pressure on the parents and the grandparents. And so they were really

pleased when it came up as a topic. And so we did it easily. And we've hosted lots of best practice visits to the leaders plan over the years. And people always ask us, how do you get people on board? Well, we were behind the people. They were in front of us with what we ended up doing. So we went zero waste to landfill in about 2010."

Once a mechanic was creative and managed to get steel inside the pipe side of a flange, taking the stress of the bolts on the plastic pipe.

"His exact answer when he was asked, well, why did you do that? 'I said, well, my grandkids asked me what I do at work about environmental stuff. And I can tell them all about this now. And they would just be proud to go home and tell his grandkids that it wasn't asked to do that.' I think the sustainability thing, because of the link with school kids, was stronger. Most of our employees have been there a long time. They've all got the kids or grandkids. And that was very influential."

Helicopter View and Suggestions to SMEs

Agfa Leeds has a strong message to share with SMEs, which is, sometimes we are too busy in the business to lift the heads up and look what we could to have a helicopter view of management, rise yourself above it and look at the whole picture, fitting the goals into systematic consideration.

Since Agfa is a cost centre, it is trying to be as innovative as it could to reduce costs. It is environmental because it makes good business sense. By reducing, reusing and recycling, Agfa at Leeds fits productivity seamlessly with other goals. As a typical joke about Yorkshiremen said, they have got short arms and deep pockets since they do not like paying for anything.

Agfa's Organizational Goal Hierarchy

When analyzing Agfa Leeds plant's goal hierarchy system, we could find that Agfa is doing very well in the cost saving process, exceeding the target and resulting in significant profit growth. Through the supply chain transformation, they worked with suppliers and customers to gain a wonderful win-win solution for stakeholders and the environment. Meanwhile, they paid special attention to people, not only engaged them to participate in the projects of safety, health and environment, but also emphasized fork lift truck safety. They also provided apperentice and graduate programmes to ensure succession planning. Together with other SMEs, Mr. Cooper actively helped organize the Leeds Manufacturing Festival and said, "The Leeds Manufacturing Festival is all about opening up manufacturing workplaces to young people and highlighting the exciting careers and job opportunities that are available right here in Leeds, covering a huge variety of different roles."

In the future, although the factor site has been closed recently, the spirit of Agfa Leeds factory regarding engagement, excellence, and environmental sustainability will not fade, and the values will prevail.

Questions

1. What are the key factors driving environmental sustainability at Agfa Leeds?
2. How did they view the relationship between environmental sustainability & productivity?
3. Examine the OGH. Identify the existing synergies and tensions between environmental sustainability and Agfa's other goals.
4. Looking at the OGH, where are the potentials to reduce tensions and/or improve synergies? What would you suggest to a manager of that firm who wanted to be both productive and sustainable?
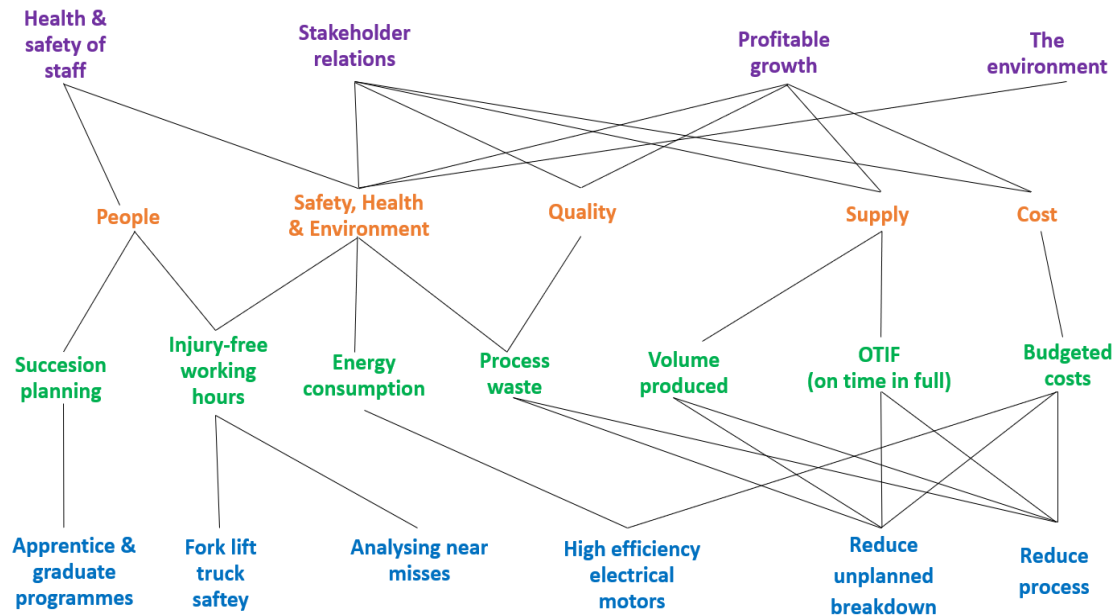
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