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Public images of manufacturing in the UK: the current situation and future prospects

Future of Manufacturing Project: Evidence Paper 19

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Public images of manufacturing in the UK: the current situation and future prospects

By

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Executive summary

The image of manufacturing has been an ongoing concern in UK policy

Since the turn of the century concern over the image of manufacturing and the impact of a negative image on the growth of the sector have been explicit in UK government documents and speeches from leading politicians. This concern has been part of the debate on the viability of rebalancing the economy to have a strong manufacturing component.

However there is a relatively thin evidence base on attitudes towards manufacturing

A review of academic literature and policy documents provided a very small number of studies which explicitly discuss the image of manufacturing. A number of surveys discuss manufacturing or manufacturing related attitudes and these provide the key messages which have appeared in UK policy discussion to date.

Secondary students do appear to have a relatively negative image of manufacturing

According to the surveys collected only 15% of secondary age students would consider a career in manufacturing. 40% of these students considering manufacturing to be boring, but 70% of them agree that they know not very much or nothing at all about engineering. Supporting the view that young people have a strongly negative view of manufacturing, over half (55%) of young students believe manufacturing to be dirty.

And women are more negative towards manufacturing than men in general

Across the surveys and the associated age groups there was a repeated trend of female respondents being more negative towards manufacturing. For example, 7 to 11 year olds were asked if they would like to have a job in manufacturing, and 44% of boys said not at all or not very much compared to 67% of girls. In the 17 to 19 year old group women chose 'male-dominated' to describe manufacturing much more (46%) than men (35%). Only 12% of women in their final or penultimate year of university would be interested in a career in engineering and manufacturing, whereas 27% said they were interested in a career in education and 26% are interested in a career in science.

But the adult public are now overall positive about manufacturing

The recent focus on manufacturing as part of the debate on rebalancing the economy appears to have had some effect on the general population's perception of manufacturing. Recent surveys of the adult population of the UK indicate that over half believe manufacturing to be high-tech and the most important sector in helping the UK economy to grow in both the short and long term. This is at odds with the policy narrative which believes the public to have a strongly negative image of manufacturing, summarised as dirty, dangerous and dull.

Potential negative impacts from the perception of manufacturing are significant

While the evidence base to trace the impact of perceptions of manufacturing on the sector and the national economy does not exist, the potential harms should not be ignored. A number of issues including future shortages of trained employees, lower levels of investment and deterioration in the trade balance may be connected to the broad perceptions of manufacturing. However, until further work investigates these areas they remain a concern rather than proven issue to be addressed by government.

Future work is needed to strengthen the evidence base in this debate

As noted above there is a general lack of academic work which rigorously addresses the issue of the image of manufacturing and whether the public's attitudes to manufacturing are hindering its growth. There appears to be a need to have a clearly focused and defined programme of research to provide input into this very important policy debate over the longer term.

I. Introduction

Manufacturing and its role in the economy has become a strong element of the policy discussion on long term growth for the UK following the financial crisis of 2008. As part of the ongoing Foresight project on manufacturing the Government Office for Science (GO-Science) has commissioned this review of the available evidence on public images of manufacturing and the potential implications for the future.

Successive government policy documents have commented on the perceived poor image of manufacturing and there have been a number of efforts to improve the image of manufacturing. There is an ongoing concern that a negative image of manufacturing will mean young people will not be attracted to the sector and a skills shortage will hamper its future growth. Beyond those entering industry directly, there is also a concern that banks and investors will have a distorted picture of manufacturing and this will hamper access to scale up finance and the patient capital that is required for growth.

However, the evidence on the public image of manufacturing, either for the population as a whole or for specific sub-groups such as secondary school age children (11 – 18), appears to be relatively thin, although two new surveys have been published in 2012 which address parts of this issue. This report attempts to provide an overview of this evidence so that future work in the area has a clear foundation from which to develop.

I.1 The UK Government's concern over the image of manufacturing

Both the current Coalition government and previous Labour governments have had concerns over the image of manufacturing and the impact a perceived negative image was having on the growth and vitality of the sector.

There has been a thread of references and actions to improve the public image of manufacturing from speeches made by the then Prime Minister Tony Blair, for example in his speech to the TUC Congress in 2002 when he stated "... we need modern manufacturing ...", through official documents outlining the government's strategy towards manufacturing (see Table 1).

Since the election of 2010 and the formation of the coalition government there has been a much stronger focus on manufacturing in the public speeches of senior members of the government. David Cameron's first economic speech after becoming prime minister set the trend, when he stated, "Our economy has become more and more unbalanced, with our fortunes hitched to a few industries in one corner of the country, while we let other sectors like manufacturing slide."¹

In a speech directly targeting the issue of the image of manufacturing entitled "Manufacturing and young people: perceptions must change"² the Secretary of State Vince Cable was explicit on the perceived negativity towards manufacturing and its impact. He said "How many people do we meet who repeat the silly and inaccurate

¹ See www.number10.gov.uk/news/transforming-the-british-economy-coalition-strategy-for-economic-growth/ for a full transcript of the speech.

² The full text of the speech delivered at the Manufacturing Summit in January 2011 is available at www.bis.gov.uk/news/speeches/vince-cable-perceptions-must-change-manufacturing.

observation that “we don’t make things any more”? This message has had a deeply corrosive effect in discouraging a younger generation from seeking a career in engineering or taking up industrial apprenticeships.” Alluding to the state of manufacturing as being positive he went on to comment “The negativity about the perception of manufacturing has become a bigger problem than the reality.”

Table 1 – summary of main UK policy documents references to the image of manufacturing

Document	Reference/Quote
The Government’s Manufacturing Strategy (Department of Trade and Industry, 2002)	No reference to image or public perception of manufacturing in the 2002 document
Review of the Government’s Manufacturing Strategy (Department of Trade and Industry, 2004)	“Manufacturing matters to us all in the UK, but its importance can be hidden by a negative public image.” “Stakeholders pointed to a widespread poor public perception of manufacturing industry as a root cause of a number of problems facing the sector. For example, it hampers recruitment of school leavers and good university graduates into the sector, and contributes to a reluctance on the part of financial institutions and the Stock Market to invest in it.”
Manufacturing: New Challenges, New Opportunities (Department of Business Enterprise and Regulatory Reform, 2008)	“We need to improve fundamentally the image of manufacturing for future generations, and demonstrate that choosing an engineering career will enable young people to tackle the key challenges facing the world and that matter to them, from climate change to water shortages in the developing world.”
Advanced Manufacturing (Department of Business Innovation and Skills, 2009)	No reference to image or public perception of manufacturing in the 2009 document
Growth Review Framework for Advanced Manufacturing (Department of Business Innovation and Skills, 2010)	No reference to image or public perception of manufacturing in the 2010 document

There is an established policy narrative that there is a serious problem with the image of manufacturing in the UK. However, those documents in Table 1 that discuss the image or perception of manufacturing either base their comments on anecdote or do not explicitly provide details of the evidence base on which the comments were based. This is an important issue to return to, as there is an issue as to whether the narrative of a strong negative image is true, and even if it is whether this is a fundamental barrier to the growth and success of the manufacturing sector in the UK.

1.2 Approach

This report is based on a review of the available academic and policy relevant literature and a request for input to professional bodies and media organisations. The review is primarily desk based, as it was completed in a short period of time and is intended to be a foundation from which further work can be commissioned by the GO-Science team if that is considered appropriate on the topic.

The literature review was conducted using a number of online databases, including *JSTOR*, *Science Direct* and *Google Scholar* as a further check. Government documents were sourced directly from central departments or where documents are no longer current, via either the National Archives or BOPCRIS. Whilst not a true systematic review, care was taken in the online searches to include multiple terms for the image of manufacturing, including attitude and perception, as well as extending the search to include images of engineering. However, as will be discussed later, there are relatively few sources that deal with these issues directly.

The call for input was sent to five professional bodies and to fifteen media organisations. This consisted of an email contact directly to a named person within each organisation with an attached letter of invitation to contribute and a short set of questions to structure the response from each organisation. All of the professional bodies contacted³ responded positively and provided feedback for the report. Unfortunately, of the fifteen media organisations contacted only one provided a response, therefore the current views of media organisations are not presented in this report.

1.3 Structure of this report

The report is in six main sections, with this introduction followed by a review of the evidence on the image of manufacturing, a brief case note on the perception of manufacturing in the United States, a commentary on interventions to improve the image of manufacturing, some thoughts on future implications of the perception of manufacturing for the UK and finally a discussion section highlighting the contrast between the policy discussion on the image of manufacturing and the available evidence.

³ The professional bodies contacted were the Confederation of British Industry (CBI), the Engineering Employers Federation (EEF), the Institution of Engineering and Technology (IET), the Institution of Mechanical Engineers (IMechE), and the Royal Academy of Engineering (RAE).

2. Evidence on the public's image of manufacturing

As discussed above there is a general position within UK and US policy that there is a problem with the image of manufacturing that needs to be fixed. However, with the rise of evidence-based policy (Boaz and Gough, 2012) there is a need to be clear what the evidence base is for the claim that manufacturing has an overtly negative image, especially amongst young people, and that this is having a negative impact on the ability of the sector to grow and prosper. This section reviews the available academic literature and any relevant survey data on images or perceptions of manufacturing.

2.1 Existing literature on the image of manufacturing

The depth of the policy narrative over the past decade on the image of manufacturing would suggest that there is a significant evidence base for these positions. However, there are few academic articles that address the perceived problem either directly or as a secondary issue. Searches on *Google Scholar* with a perfect term, made up of one of perception, image or attitudes and manufacturing, each return around 100 hits which is extremely low. Most of these articles are management articles on the development of manufacturing strategy and do not discuss public attitudes toward manufacturing at all.

A number of the journal articles that discuss the image of manufacturing are in more practice oriented journals and tend to be comment or opinion pieces rather than original research articles. For example, Sir John Banham's (then Director General of the Confederation of British Industry) piece in *Engineering Management Journal* (Banham, 1992) is based on his lecture to the IEE Management and Design Division at the end of 1991. The broad problem of negative perceptions of manufacturing is stated clearly but without supporting evidence. "Young people, those who influence their choice of career, Members of Parliament and the economic policy establishment generally, lack a first-hand understanding of the realities of manufacturing in Britain today." In the same journal a three part series was carried on the factors which have influenced the competitive performance of industry in Japan, Germany, the USA and the UK. In the third part of the series (Terry, 1994), again without reference or evidence it is stated that "... problems such as ... the poor image of manufacturing ..." are symptoms of weak industrial performance.

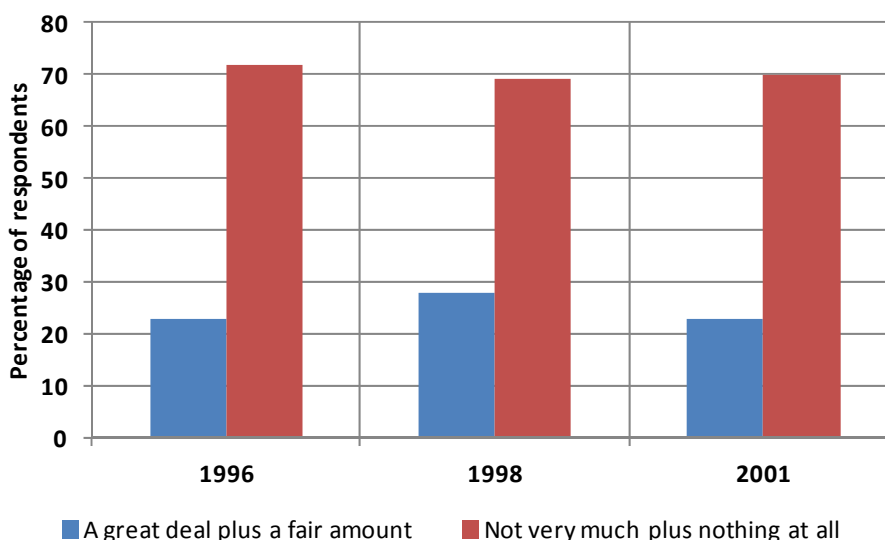
In a similar vein in an interview piece for *IEE Manufacturing Engineer* (Deaves, 2004) Stephen Radley, then chief economist with the Engineering Employers Federation (EEF) when discussing skills shortages in manufacturing comments "Related to that, I think manufacturing has an image problem." Again, the context is not one of structured research; rather it is the gathering of expert opinion. Finally, *Manufacturing* reported a panel discussion held as part of a wider seminar on supply chain management (Cervi, 2008) in which again expert opinion was reported almost as fact. "Gunther Kruse, another member of the IET panel, said: "In Germany ... there is still a perception there that manufacturing is still important to the economy. In the UK achieving such a perception would need a culture change and that takes decades." It is almost an article of faith within these types of articles and discussions, something that can be asserted without further need for qualification or support.

Articles that discuss the issue of perception of manufacturing but for a different purpose are those concerned with the teaching of design and technology within schools. For example, McLaren (2007) investigates new pedagogical techniques to teach product design and comments “The pedagogy attempts to challenge the anti-commercial manufacturing attitude that prevails among teachers and students ...” However, while some data is presented for the attitudes of students, based on the late 1990s Ipsos MORI surveys discussed in section 2.2, none is given for those of the teachers. These pieces again appear to have decided on the narrative and use the available data to form a brief argument on the negative perceptions and their claimed negative impacts.

2.2 Survey evidence for young people and students

One of the potential impacts of a negative image of manufacturing will be a lack of people willing and wanting to work in various manufacturing industries. Therefore, the attitudes of young people, especially those making career decisions in their teens, will be very important. If there is a dominant negative image the potential supply of well trained workers needed may not manifest itself, constraining the growth of manufacturing.

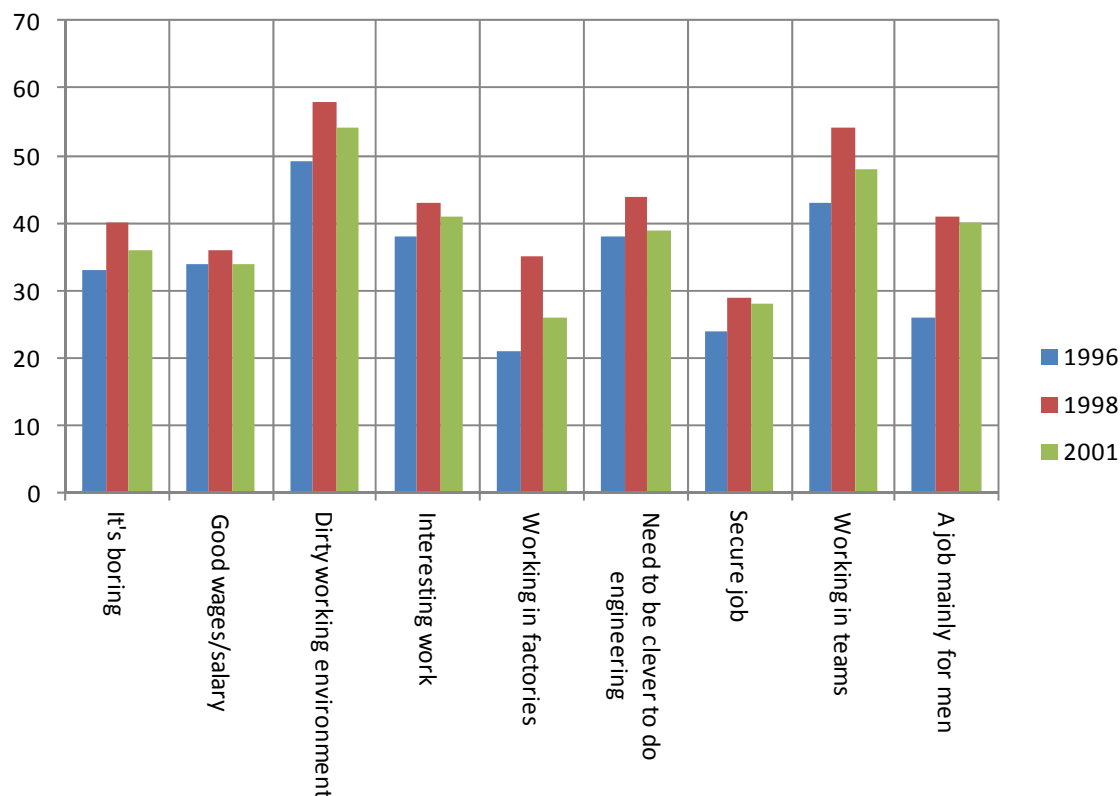
Figure 1 - 10 to 16 year olds’ response to ‘How much do you know about engineering?’ (Ipsos MORI, 2001)



One of the most direct surveys of young people’s attitudes to engineering and manufacturing is that carried out by Ipsos MORI for the Engineering and Marine Training Association (EMTA), which has subsequently through merger become the Sector Skills Council for Science, Engineering and Manufacturing Technologies (SEMTEA). The survey looked at the attitudes of 10 to 16 year olds to careers in engineering and manufacturing every second year between 1996 and 2001, with between 3,000 and 4,000 respondents in each cohort. Over the three surveys the percentage of young people agreeing that they know not very much or nothing at all about engineering is stable at 70% (see figure 1). Also very stable was whether the students would consider a career in engineering, with approximately 15% agreeing they would and just over 60% saying they would not. The survey also asked whether the students agreed with various statements about working in engineering (see figure 2). Between 30% and 40% agree that engineering is boring while over half think that working in engineering means working in a dirty working environment. At the same time, under a third agree that engineering is a secure job while around 4 in 10 believe that engineering is mainly for men. When asked which jobs would be their preferred choice only 7% of the respondents chose professional engineer, as

opposed to lawyer (16%), professional sportsperson (16%), vet (14%) or being a teacher (14%).

Figure 2 – percentage of young people agreeing with statements about working in engineering (Ipsos MORI, 2001)



Having a stable questionnaire over six years with a large cohort provides a very strong set of data on the attitudes of 10 to 16 year olds. The relative stability of some of the questions suggests that through the time period little was changing in the cultural conversation on manufacturing. The issue in using this data to inform policy making at this point in time is that a significant amount of effort has been expended to change attitudes towards manufacturing, as well as the introduction of the post financial crisis context. The problem of reflecting on old data is discussed more fully in section 6.

Since 2008 Engineering UK (previously known as the Engineering and Technology Board (ETB)) has commissioned a survey of public attitudes towards engineering, which has included since 2009/2010 a section on attitudes to manufacturing. This survey is of particular interest as it has a large respondent pool (typically greater than 4,000) and it also provides a breakdown of the data for 7 to 11 year olds, 12 to 16 year olds and 17 to 19 year olds, as well as for the general public and for educators.

The 2010 survey (FreshMinds Research, 2010) had a strong focus on the 17 to 19 year old age group, with 1,163 respondents in this age category. When asked what terms or words they most associated with manufacturing, this age group chose production (77%) and technology (66%) most frequently, compared to negative terms such as boring (13%) and backwards (3%). When discussing a career in manufacturing, 43% said it was male dominated, 41% believe it to be repetitious and 33% said it was boring. Only 15% of 17 to 19 year olds believe a career in manufacturing to be well paid according to this survey.

The sample sizes for the 12 to 16 year olds and 7 to 11 is much smaller (152 in the former and 150 in the latter) so interpretation of the results in this section should be done with care. However for the 12 to 16 year olds, manufacturing was thought not to pay as well as being a lawyer or a doctor and the image of manufacturing was worse than that of doctors, lawyers, accountants and teachers. When the 7 to 11 year olds were asked if they would like to have a job in manufacturing, 44% of boy said not at all or not very much, compared to 67% of girls.

As a critical influence channel on career choice for children, teachers and careers advisors were contacted to take part in the survey. However, the number of career advisors who responded to the survey was very low and so this group is not represented in the analysis. The response rate for teachers was also very low (3%) and so the initial target of 1,000 was not feasible, leading to a final sample of 241. For this group there was very little agreement that the image of manufacturing has improved (7%) but 62% agreed that they would recommend a career in manufacturing. By contrast, those who said they would not recommend a career in manufacturing thought it provided unreliable employment (53%), was a dying industry (37%) and would be poorly paid (32%).

The results for the 2011 version of the Brand Monitor (FreshMinds Research, 2011) tell a similar story to the 2010 results, indicating that some of the attitudes are stable over a two to three year period. Within the 2011 results there are significant differences for men and for women. For example, in the 17 to 19 year old group women chose 'male-dominated' to describe manufacturing much more (46%) than men (35%). The impact of the recession appears to have made men significantly more open to a career in manufacturing, with 31% of men in this age group agreeing compared to 16% of women. The 12 to 16 year olds in the 2011 survey most associated manufacturing with factories and again thought that doctors and lawyers are better paid than those working in manufacturing. Continuing the trend from the 2010 survey, in this sample manufacturing was thought to have a worse reputation for 12 to 16 year olds for the four comparison professions (doctor, lawyer, teacher, and scientist). For 7 to 11 year olds, manufacturing is boring (39%) and 34% of boys said they would like a career in manufacturing compared to 27% of girls, while 54% of boys and 56% of girls said they would not like a career in manufacturing.

Beyond whether students in general are interested in or have a positive image of manufacturing and engineering, there is a further question on whether women are specifically negative towards a career in engineering. According to a recent report from the Council for Industry and Higher Education (2011) less than 10% of engineering professionals in the UK are women, compared to 26% in Sweden for example. The main part of the CIHE report is a survey of over 600 women in their final or penultimate year of university. For this sample, approximately 12% of the women would be interested in a career in engineering and manufacturing, whereas 27% said they were interested in a career in education and 26% are interested in a career in science. The three terms that were most associated by these women with engineering and manufacturing were male-centric (58%), useful (46%) and innovative (42%). The term 'dull' was chosen by 32% and 'exciting' was only chosen by 8% of the sample.

2.3 General surveys

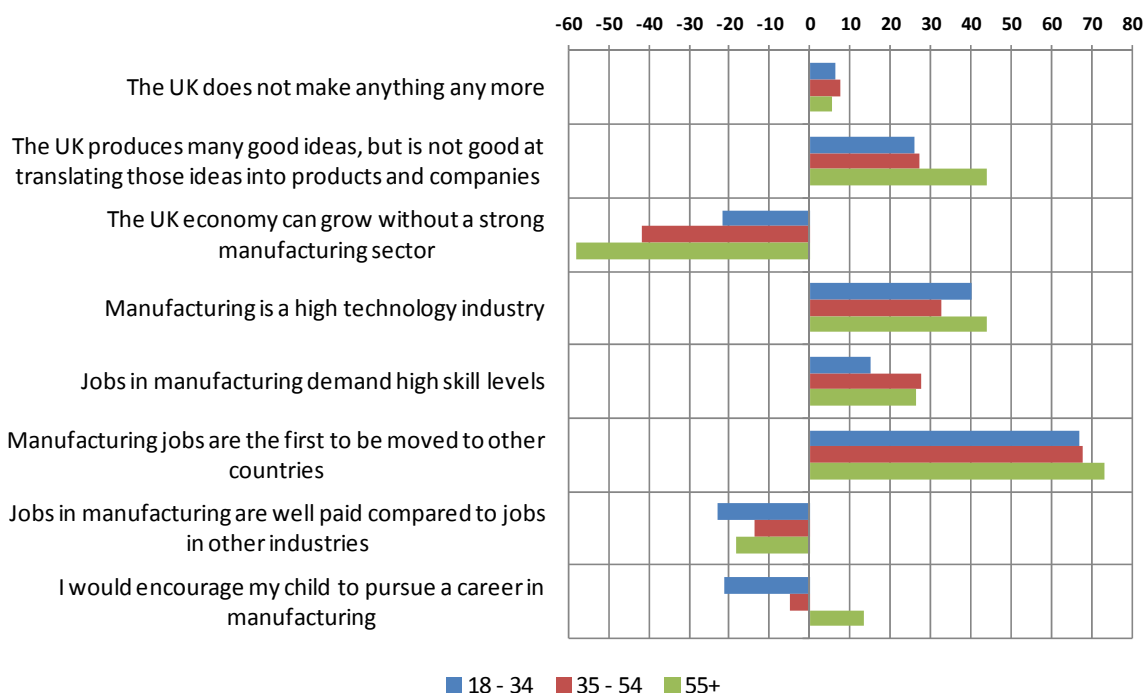
While the image or perception of manufacturing has been a common cause for concern in policy documents in the UK, there is surprisingly little hard evidence on the broad attitudes of the public towards manufacturing.

For the general sample (those over 20 years of age) of the Engineering UK survey (FreshMinds Research, 2010) discussed in section 2.2 the terms most associated with manufacturing were production (80%) and technology (65%), whereas boring was only associated with manufacturing by 8% of the sample. When asked what terms they would most associate with a career in manufacturing the most common answers were challenging (41%), male dominated (39%) and repetitious (37%). Only 11% of those sampled agreed that the image of manufacturing had improved in the previous year.

The most recent survey specifically on attitudes to manufacturing in the UK is that carried out by Livesey (2012) in partnership with YouGov-Cambridge, which was a nationally representative survey of 1,452 UK adults carried out in January 2012. This survey was developed to move beyond what had been mostly an anecdotal discussion to date and provides a foundation to discuss how the perception of manufacturing varies between age groups and geographic regions of the UK. As the report commented “the public have a nuanced view of manufacturing” as 50% agree it is high tech but 74% believe manufacturing jobs are the first to be moved overseas.

Eight core questions were asked in the survey to give a more balanced view of how the public see manufacturing. Figure 3 shows the responses to these questions by age group, showing the percentage in each age group that agreed less than those that disagreed (neutral or don't know responses are not shown).

Figure 3 – Percentage of respondents by age agreeing to each statement minus those disagreeing (Livesey, 2012)

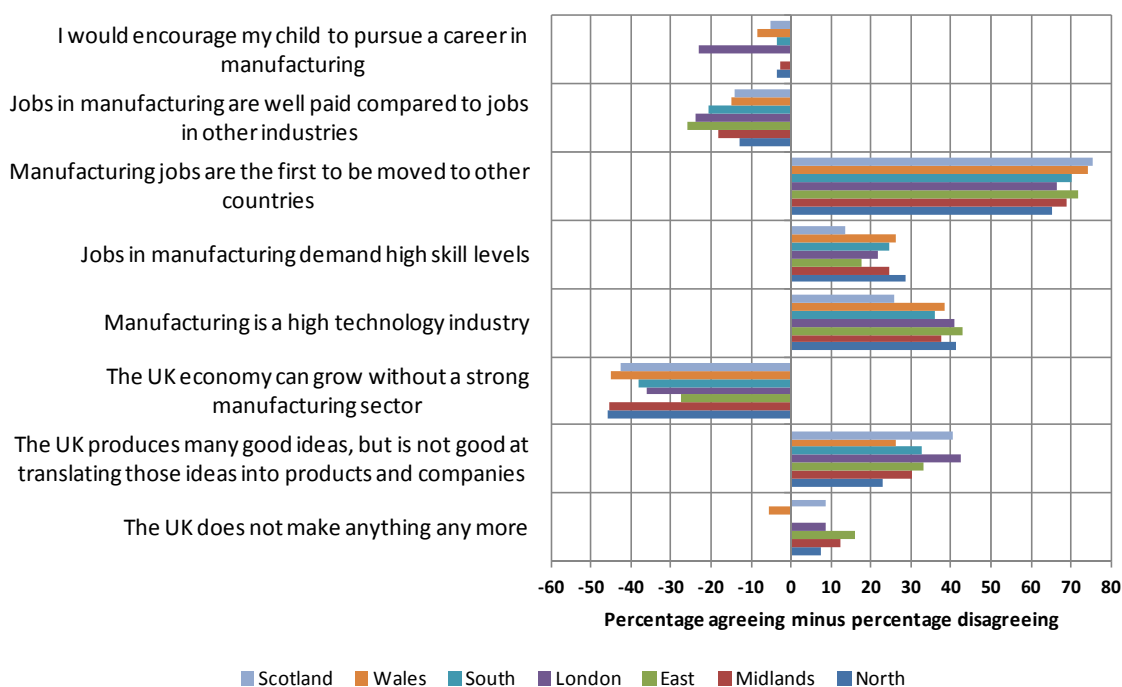


There are obvious differences in response by age with a number being statistically significant. Older respondents (55+) in some ways are more negative than younger respondents, with 62% agreeing that the UK is not good at translating ideas into products and companies and only 18% disagreeing (44% balance). However, the over 55s believe the UK needs the manufacturing sector much more than 18 to 34 year olds, as 72% disagree and 14% of the older respondents agree that the UK can grow without a strong manufacturing sector, compared to 21% agreeing and 43% disagreeing for the 18 to 34 year olds. The younger respondents have a lower level of agreement that manufacturing

demands high skills (36% agree, 21% disagree) than the over 55s (49% agree, 23% disagree). The largest remaining difference in response is whether the public would encourage their child to pursue a career in manufacturing. There is a marked difference between the older respondents (31% agree, 18% disagree) and the youngest (13% agree, 34% disagree). This again reflects an ongoing concern that younger workers and those coming into the work force are less likely to choose a career in manufacturing.

The survey was also representative of the different regions of the country (but did not include Northern Ireland). The balance of positive and negative responses to the questions shows some variation but none that is technically statistically significant (see figure 4). The region that was most negative regarding encouraging children into manufacturing was London (12% agree, 35% disagree) compared to the East which had equally positive and negative responses (17% in each case). Another point of difference is whether the region agrees that the UK can grow without a strong manufacturing sector. While all regions overall disagree, the East was the least negative (23% agree, 50% disagree). Finally, when asked to agree or disagree that the UK does not make anything any more the only region that disagreed overall was Wales (38% agree, 44% disagree) with the East being in strongest agreement (49% agree, 33% disagree).

Figure 4 – Percentage of respondents by geographical region agreeing to each statement minus those disagreeing (Livesey, 2012)



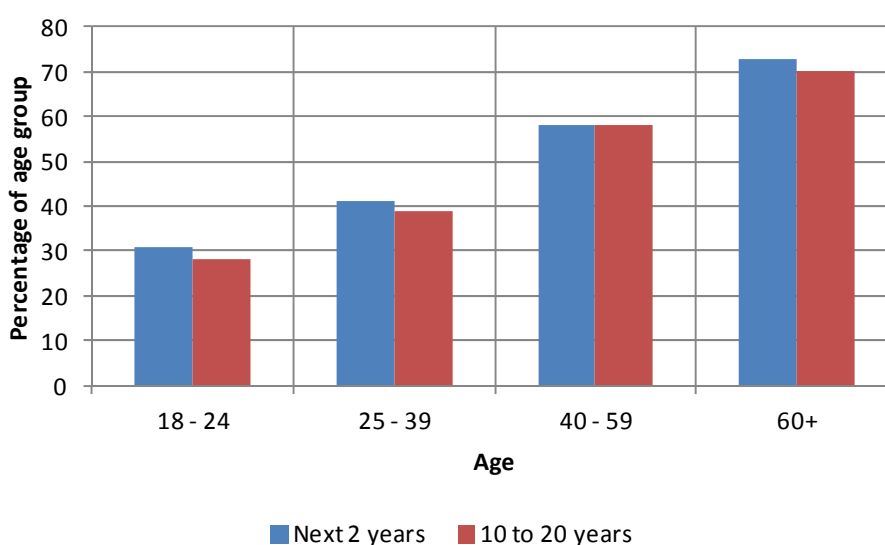
A new survey has been carried out by YouGov-Cambridge (2012) which investigates new models of growth but contains specific questions on manufacturing.⁴ This work was carried out in July of 2012 and surveyed 1,748 adults in Great Britain. Perhaps the most interesting result, given the ongoing discussions on rebalancing the UK economy, is that 55% of the sample believe that manufacturing will be one of the most important industries in helping the economy to grow in the next two years. That number falls slightly to 53% when considering growth over the next ten to twenty years. Manufacturing was the sector

⁴ See www.yougov.polis.cam.ac.uk/?p=3354 for further details.

that was chosen the most, with construction second (37%), retail third (26%) and financial services fifth (17%). However when asked whether the UK will be one of the world's 10 largest manufacturers in 10 years' time 63% of those sampled disagreed. This again speaks to a complexity in how manufacturing is viewed, as it is clearly thought to be important in this period of recovery after the financial crisis of 2008/2009, but it is not thought to retain its position in terms of output.

Even though the results of this survey indicate a perception that manufacturing is important to future growth, there is pessimism about the size of manufacturing in the economy, with 47% agreeing that the share of the economy based on manufacturing will get significantly smaller over the next 10 years.

Figure 5 – Percentage of public by age indicating manufacturing as important to UK economic growth (You-Gov Cambridge, 2012)



2.4 Attitudes of the professional and learned societies on the image of manufacturing

Many different actors and institutions play a part in both setting our perception of manufacturing and in how manufacturing will evolve as part of the UK economy. As part of this report a number of professional organisations representing manufacturing, engineering and industry were contacted and asked to complete a short survey on the image of manufacturing. These results are interesting as a contrast to the broad picture from the public surveys reported above but also are important as both the professional bodies and societies are key to future developments in the image of manufacturing in the UK.

The professional bodies and societies that were contacted as part of this report were –

- Confederation of British Industry (CBI)
- Engineering Employers Federation (EEF)
- Institution of Engineering and Technology (IET)
- Institution of Mechanical Engineers (IMechE)
- Royal Academy of Engineering (RAE)

Representatives of each organisation were sent an email with an attached letter of invitation to participate and a brief set of survey questions (reproduced in the annex). In the following figures each organisation is represented by a different shape but we have not provided a key so that the pattern of response can be seen but the respondent is not identified.

Figure 6 – professional bodies’ opinion of perceptions of manufacturing

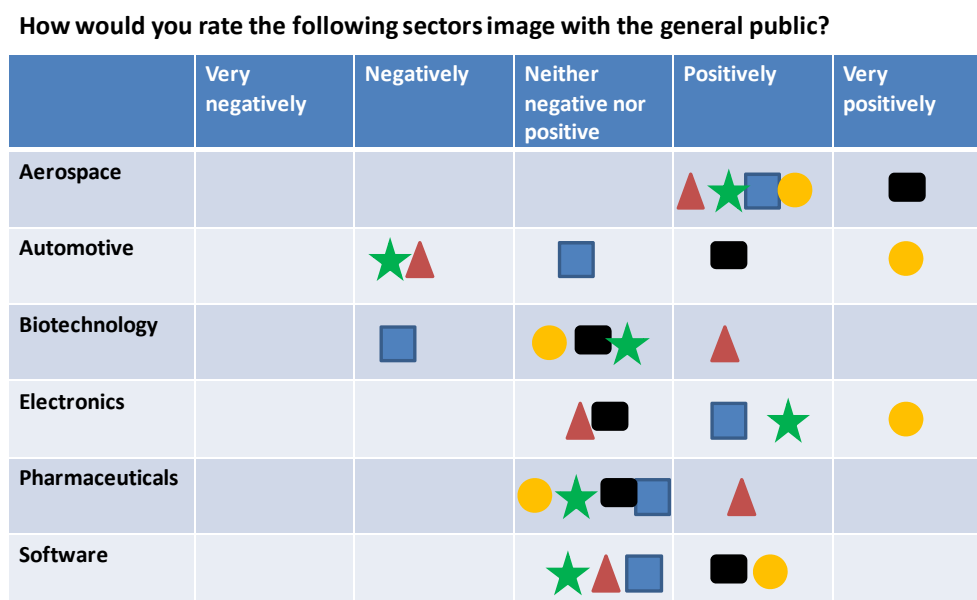
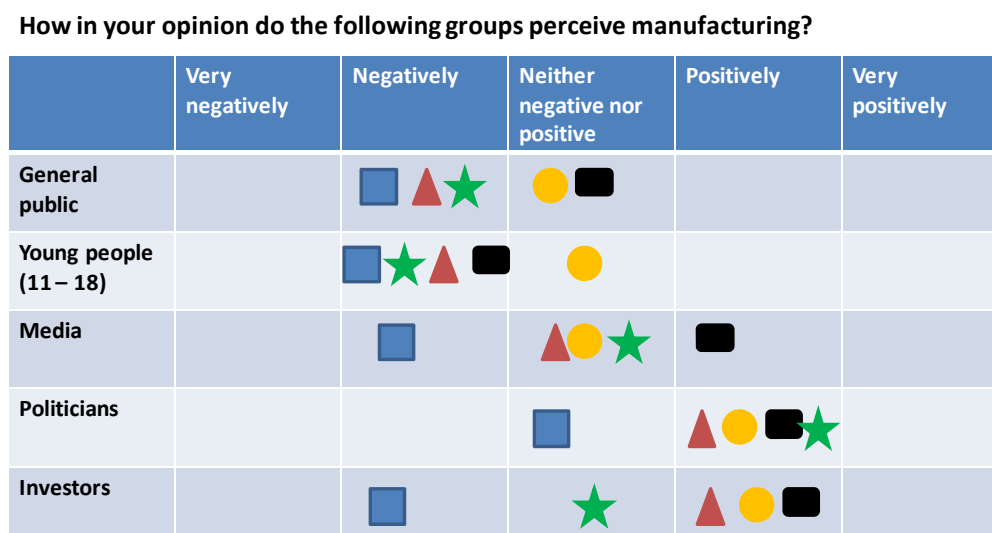


Figure 7 – professional bodies’ opinion of public perception of specific sectors



As figure 7 highlights, there are differing opinions on how each group perceives manufacturing with a general pattern from negative to positive from the general public through to politicians and investors (the group with the broadest spread of responses).

In contrast to the general question on manufacturing as a whole, we also asked each respondent how they believe the general public view different sectors. There is significant variation in the responses, with aerospace and pharmaceuticals having a very similar

opinion across the organisations, whereas automotive appears to have completely split the respondents from negatively through to very positively.

As noted above we also attempted to collect the views of media organisations but did not receive sufficient responses to report them. However, the professional bodies generally view the media's portrayal of manufacturing as neutral. In the case of print media four out of five respondents chose 'neither negatively nor positively' for the imagery used (the last respondent chose 'positive'). The response for broadcast media was evenly split, with two choosing 'negative', one choosing 'neither negatively nor positively' and two indicating 'positive'.

The professional bodies and societies are in complete agreement when asked whether the public image of manufacturing is more positive or negative in France, Germany and the USA. All of the respondents thought that France and the USA were more positive, bar one who indicated France was much more positive. All of the respondents thought that Germany has a much more positive public perception of manufacturing.

Finally, when asked how important improving the image of manufacturing in the UK is there was some divergence. One respondent thought it is important, two indicated very important and two believe it to be crucial. Again, this is important to consider when trying to understand which organisations can and should play a role in promoting manufacturing, but also to acknowledge that there are differences of opinions at the institutional and individual level on whether the image of manufacturing requires significant attention.

2.5 Other data

A small number of mainly industry publications focus on manufacturing or in the case of the US high tech or advanced manufacturing. General Electric Capital (GE Capital) has carried out a survey of senior executives in the high tech manufacturing sector⁵ every six months since December 2010. Looking at the survey results for December 2010 (GE Capital, 2010) and June 2012 (GE Capital, 2012) while the image of manufacturing is not addressed directly, there is a consistent concern over the lack of skills available in new recruits, which may reflect the attitudes expressed in the student surveys in section 2.2. For the most recent survey (GE Capital, 2012) "... almost two-thirds (65%) of those who had been recruiting engineers over the last 12 months said that they had had difficulty recruiting the right engineering staff." When prompted to suggest how to improve the supply of qualified engineers "The most popular answer saw 94% of respondents stating that they felt one remedy for the engineering skills shortage would be to promote engineering as a successful career choice."

⁵ The companies included fulfil a set of criteria which includes that they use a high level of design or scientific skills to produce technologically complex products and processes, and that they are a primary manufacturer of components, equipment or products rather than an assembler of components.

3. International comparison: the case of the United States

The policy focus on manufacturing in the United States has been slightly less explicit until recently. During the Bush Administration there was renewed attention to manufacturing, responding to perceive challenges from emerging economies such as India and China. As part of their response, the Department of Commerce released a new manufacturing strategy in 2004 based on a series of roundtables on manufacturing. The report (Department of Commerce, 2004) highlighted the worry that participants had regarding the image of manufacturing - "Some roundtable participants went further, describing what they saw as a pervasive bias against manufacturing, based on an old assembly-line image, causing the best and the brightest to pursue careers outside the manufacturing sector."

President Obama's 2012 State of the Union address focused on manufacturing as the bedrock of future growth. The contrast to the financial sector was writ large when he said, "We will not go back to an economy weakened by outsourcing, bad debt, and phony financial profits" and called for "an economy built on American manufacturing."⁶

The Advanced Manufacturing Partnership (AMP) under the auspices of the President's Council of Advisors on Science and Technology (PCAST) released in July 2012 a new policy plan entitled *Capturing Domestic Competitive Advantage in Advanced Manufacturing* (PCAST, 2012). The report is based on four regional meetings held around the United States which were attended by 1,200 stakeholders in industry, academia and government, as well as expert consultation. Sixteen recommendations are proposed which includes a recommendation to "Correct Public Misconceptions about Manufacturing". The report claims that "... persistent public misconceptions about the manufacturing sector have taken hold, tarnishing its image as a desirable long-term career focus ... The main misperceptions about employment in manufacturing can be summarized by the three "D's" that characterize the work as dull, dirty and dangerous." This parallels the concerns in the UK, again with the main issue being the supply of skilled and trained young people entering the manufacturing industries.

3.1 US public attitudes to manufacturing

Our review of the available literature suggests that there is only one other country with a comparable national survey of the public's view of manufacturing to that of Livesey (2012). Since 2009 the Manufacturing Institute in partnership with Deloitte have produced a report on the perceptions of the US public towards manufacturing (Deloitte and Manufacturing Institute, 2010, Deloitte and Manufacturing Institute, 2011). The survey results for each year are based on a sample of 1,000 Americans polled online.

⁶ The full text of the 2012 State of the Union address is available at www.whitehouse.gov/the-press-office/2012/01/24/remarks-president-state-union-address.

Figure 8 – US attitudes to manufacturing (Deloitte and Manufacturing Institute, 2011, Deloitte and Manufacturing Institute, 2010)

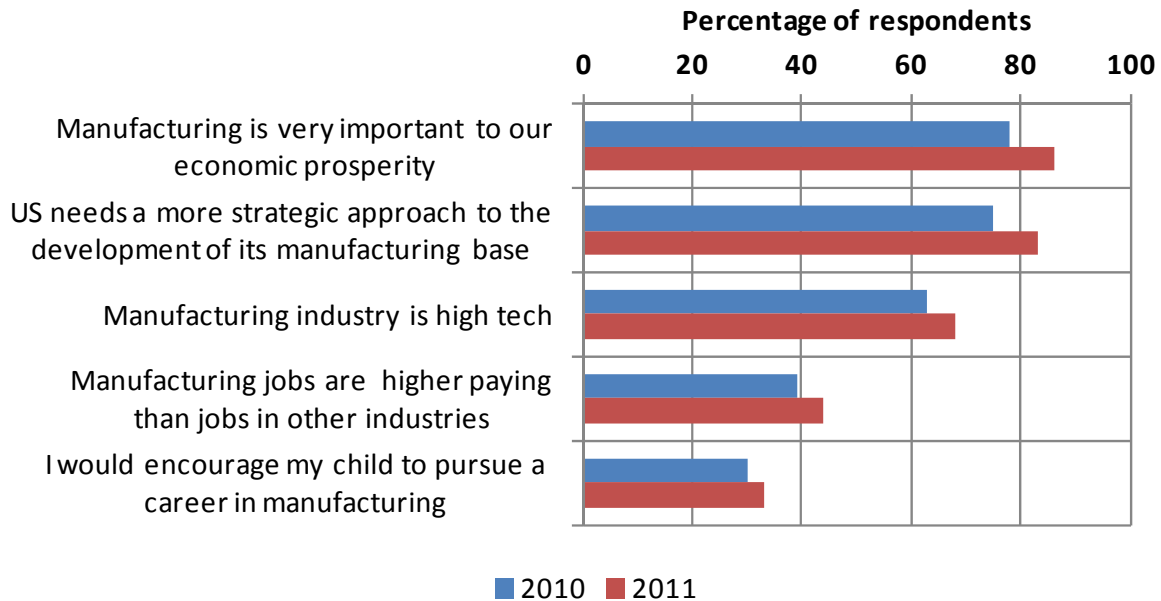


Figure 8 shows a selection of the questions that were stable between the two most recent surveys showing the levels of agreement in the responses.

It may not be surprising in the current context that manufacturing's importance to economic prosperity has risen in the eyes of the public with 78% agreeing in 2010 and 86% agreeing in 2011. The manufacturing industries are in the main viewed as being high tech but less than half of the sample agree that manufacturing is higher paying compared to other industries. Finally, while the number of respondents agreeing they would encourage their child to pursue a career in manufacturing has risen slightly the level of agreement is 33% in 2011.

The responses to the Deloitte survey are more positive than those for the Livesey (2012) survey and this may reflect long standing cultural differences in how the US and the UK economies have evolved over a significant period of time. However, as will be discussed in section 6 these surveys do not address or attempt to answer what level of agreement or positivity is necessary for the respective manufacturing sectors to prosper.

4. Interventions to shape the public's image of manufacturing

There have been a number of interventions both in the UK and in other countries to improve the image of manufacturing. This section provides a brief summary of the main programmes in the UK along with examples from other countries where available. Also, based on the input from the learned societies comments are provided on how government might in the future structure any interventions aimed at improving the image of manufacturing.

4.1 Programmes to improve the image of manufacturing

The current government has initiated two programmes that have attracted positive attention from manufacturers. The first is *See Inside Manufacturing*, the aim of which is to have secondary school students and careers advisors visit factories to get a clearer sense of what the reality of manufacturing is in the UK. The programme focused on the food and drink, automotive and aerospace sectors originally, with an uneven spread of engagement from companies around the country. According to the Automotive Council UK in the first year of the campaign over forty companies participated and hosted visits from schools.⁷ Companies from the food and drink sector who have also been involved include Coca-Cola, Britvic and General Mills.⁸

As well as attempting to have students visit and see factories a second programme, *Make it in Great Britain*, was launched in November 2011. This programme was looking for companies to promote the leading near market products or processes and culminated in an exhibition at the Science Museum over six weeks ending in the middle of September 2012.⁹ Based on a competition format in five areas, over 30 products and companies were taken forward to the exhibition and have been included in a voting process open to the public.

Earlier attempts in this area did not meet with success however, as exemplified by Manufacturing Insight, an independent company formed following the 2008 manufacturing strategy which was tasked with improving the image of manufacturing with 14 to 19 year olds. The company was intended to be self financing, based on industrial sponsorship and its activities, but having been founded in September 2009 it was shut down in February 2011.¹⁰ According to the Department of Business Innovation and Skills (BIS) the company did not secure enough interest from industry and could not achieve the income required to fulfil its mandate.

While there appears to be a strong contrast between the approaches recently taken and that of four years ago, there has been no formal evaluation of the impact of these programmes to date. Given the scale of the problem in rebalancing the economy and

⁷ See www.automotivecouncil.co.uk/join-the-industry/see-inside-manufacturing/what-is-it/ for further details.

⁸ The Food and Drink Federation (FDF) have full details of their members participation online at www.fdf.org.uk/seeinside_who.aspx.

⁹ The companies taking part in the exhibition were discussed in *The Manufacturer* article online at www.themanufacturer.com/articles/the-companies-who-make-it-in-great-britain/.

¹⁰ See www.themanufacturer.com/articles/bis-closes-insight/.

supporting the growth of manufacturing in the UK, it is unclear whether the current programmes whilst well received are significantly altering either the perceptions of the public or the trajectory of the manufacturing sector in the UK.

4.2 Taking interventions forward

As part of our request for input from the professional bodies and societies we asked what actions were necessary for the government to improve the image of manufacturing. Each of the organisations commented and these comments have been aggregated and therefore should not be attributed to any single organisation.

Continuation of the programmes currently in place

Most of the bodies contacted were very positive towards the current programmes and were supportive of them being retained. The programmes were thought to be successful and should be given time to have impact rather than being cut off before they could achieve the goals that they had set.

Acting as a co-ordinator

It was commented that there are many organisations who wish to contribute positively to manufacturing growth in the UK and in particular to improving the image of manufacturing. One potential role for any government agency or intervention is to act as a co-ordinator for those who wish to voluntarily participate. This could reduce overlap between activities and allow the organisations to have greater reach and impact.

Consistency in approach

As noted above many of the organisations were positive about the current programmes to improve the image of manufacturing and were supportive of them being retained. This was also reflected in a broader comment that there is a desire for there to be consistency in the approach to manufacturing across government departments.

5. Future implications

The data presented in sections two to four provide the best available collation of existing data on public attitudes towards manufacturing in the UK, with a comparison to available data for the United States. This section discusses whether there is any trend or pattern in the data and what this might imply for future manufacturing growth.

5.1 Trends in the data

Given the relative paucity of long term data and the lack of comparability between many of the surveys it is very difficult to provide a clear trend in public attitudes towards manufacturing. However, reviewing the data allows for some commentary on whether there are potential patterns and issues that should be highlighted.

The surveys that have been repeated are that carried out by SEMTA between 1996 and 2001 and the Engineering UK survey which has been ongoing since 2008. Both have a strong level of stability in the responses that they receive, although one is now over a decade old. From the SEMTA data, it would appear that there is stability in the attitudes of students towards manufacturing, with only 15% indicating that they would consider a career in manufacturing. This is a similar figure to that from the Engineering UK data on whether manufacturing is well paid or not, as again 15% of that sample agree. These points are backed up by the individual surveys carried out by Livesey (2012) and YouGov (2012), as these indicate a concern in the broad public on the level of pay in the manufacturing sector compared to others and an overall negative balance for encouraging children to take on a career in manufacturing.

The actual image or impression of the sector as being based on technology, predominantly being high-technology, and being interesting is very strong. Across the surveys there is a general sense that both students and adults do not believe the stereotype of dull, dirty and dangerous. However, there are strong negatives potentially around the perception that it is a male dominated industry and that women are not attracted to the sector to the same level as men.

One point of interest from the data that is available for the United States is that between 2010 and 2011 attitudes have become more positive across all of the questions. Whether this is an artefact of the survey methodology or within the margin of error for this scale of survey is unclear. However, there is a broad sense that there is a continued focus on manufacturing and that this has reached the public in a very real way.

Again it should be stressed that this is an interpretation of the varied data points that the various surveys provide. It would potentially be of great value if a stable and well directed survey was instigated by government in order to have a longer baseline comparing manufacturing to a broad set of industries.

5.2 Potential impacts of attitudes

Concern about the image of manufacturing assumes that there are knock on effects from the image to outcomes for the sector and the economy. What are the potential negative impacts that could arise from a strongly negative perception of manufacturing? The seven issues listed below are not intended to be exhaustive and a link between assumed attitudes and a negative outcome is not claimed.

Future workforce shortages

If insufficient numbers of students are training in technical subjects and if a small percentage of those who are training in technically related disciplines is interested in a career in manufacturing there may be a shortage of qualified labour to support manufacturing growth. However, this concern needs to be put into context with the increasing automation of production and an ongoing debate (especially in the United States) on whether growth in manufacturing may lead to jobless growth (Brynjolfsson and McAfee, 2011).

Lack of manufacturing based start ups

In a similar manner to a lack of trained and interested labour, there is a concern that a negative image of manufacturing will lead to a lower number of start ups which are manufacturers or working within the manufacturing sector. Without data to support the position it is difficult to ascertain whether this is a real effect. Recent work on strategy for manufacturing start ups (Lim et al., 2008) has provided a perspective on the issues that such companies face. It is interesting to note that perceptions or negative attitudes towards manufacturing do not appear in the list of issues, specifically not in the sections focusing on finance or human resources.

Availability of funding

The perception of returns from manufacturing start ups will be mediated strongly on the type of product or market that the company has focused on. If manufacturing is perceived to have low returns, high risks, or a lack of follow on investment, there may be a constraint in financing. The performance of venture funds focused on technology has not been as strong as for other categories (BVCA, 2011) and this may be more important than a general negative impression of manufacturing.

Coherence and focus in government

A concern for manufacturing in policy terms is whether the sector is well understood by policy makers. According to the report of an AIM/CBI forum in 2009 (Benedetti et al., 2010), *The Ten Myths of Manufacturing*, "From the responses of the senior representatives attending from business, academia and the policy community, it became clear that there is considerable misunderstanding about modern manufacturing in general and manufacturing in the UK in particular." This speaks to the need to understand all stakeholders' perceptions of manufacturing, including how policy makers view manufacturing and how manufacturers view the policy process.

Breadth of employment opportunities

Depending on whether the types of manufacturing developing in the UK are labour intensive or not, the expansion of manufacturing companies in the country may provide a welcome diversity within the potential job market. However, if perceptions are damping individual enthusiasm to work in manufacturing as well reducing the number of manufacturing start ups this could restrict employment diversity.

Trade balance

According to analysis carried out by the Department of Business, Innovation and Skills (BIS, 2010) "In 2009, UK exports of goods produced by the manufacturing sector totalled some £205bn in 2009 representing around 53% of total UK export by value." The potential knock-on effect of a reduction in manufacturing companies would be a widening of the trade deficit in goods, for which increases in trade in services would not be able to compensate.

Innovation spend

A core component of long term growth in the UK is based on strength in innovation. A key element of innovation performance is spend on research and development (R&D). Roughly 75% of private sector R&D spend in the UK comes from manufacturing companies (BIS, 2010) and any negativity towards manufacturing and a further reduction in manufacturing as a share of the economy could disproportionately impact levels of R&D carried out in the UK.

6. Discussion

The report has brought together the publicly available research and evidence on the public's attitudes to manufacturing. It has also discussed the quality of the evidence and whether the evidence shows differences in attitudes by age or gender. The lack of deep research on the issue and the conflicting definition and interpretations of manufacturing make this task very difficult. This review has attempted to bring together a number of different surveys all of which have different audiences and different objectives. Due to this, direct comparison between the age groups and across the presented evidence should be done with care.

The following sections provide a summary of the key points that come from the available surveys as well as providing a discussion on the quality of the evidence base and what steps might be recommended for the ongoing manufacturing foresight.

6.1 Summary of the existing evidence

There are a number of key headlines from the data for the UK which include:

- Young people appear to have a distinct lack of knowledge about engineering as 70% agree they know not very much or nothing at all about engineering (Ipsos MORI, 2001)
- 15% of secondary age students would consider a career in engineering (Ipsos MORI, 2001), whereas 12% of women about to leave university would consider a career in engineering or manufacturing (Council for Industry and Higher Education, 2011)
- Approximately 40% of secondary age students consider manufacturing to be boring (Ipsos MORI, 2001), compared to 15% for the general population (FreshMinds Research, 2010) and 13% for 17 to 19 year olds . One third of university age women consider engineering to be dull (Council for Industry and Higher Education, 2011)
- Over half (55%) of young students also believe manufacturing to be dirty (Ipsos MORI 2001)
- Just under two-thirds of university women (58%) believe engineering to be male-centric (Council for Industry and Higher Education, 2011) compared to 39% of the general population agreeing that engineering is male-dominated (FreshMinds Research, 2010)
- Both the UK and the US public have low responses when asked if they would encourage their child to have a career in manufacturing, with 20% of the UK respondents agreeing they would (Livesey, 2012) compared to 33% for the US sample (Deloitte and Manufacturing Institute, 2011). Younger respondents to the UK survey are less likely to agree that they would encourage their child into a career in manufacturing (Livesey, 2012)
- More recent UK surveys have indicated that the general public now have a more positive view of manufacturing overall, with 50% agreeing that manufacturing is high-tech (Livesey, 2012) and more than half agreeing that manufacturing will be the most important sector in helping the UK economy grow in the coming 2 years and the next 10 to 20 years (You-Gov Cambridge, 2012)

6.2 Issues with the evidence

An overriding impression comparing the policy narrative to the available evidence is that there is potentially a problem with youth engagement on manufacturing issues but that the evidence base is not strong enough to be clear on this issue. Also, the responses from those over 18 do not appear to support a narrative which says the public have a false image of manufacturing as being dirty, dull and dangerous. This begs the question as to whether the problem with the image of manufacturing is within the policy process or in the public in general.

As discussed above this review has attempted to blend together a number of surveys over a period of approximately 15 years. Each of these surveys has a specific purpose, target audience and boundaries of terminology. Whilst the first two, purpose and audience are important, the issue of terminology is key. Across this discussion there appears to be an elision of manufacturing and engineering, as well as other terms such as science and technology. Future work on the issue of how manufacturing is perceived needs to have a clear and consistent terminology that is robust in survey across age groups.

Beyond whether the surveys are measuring attitudes to the same thing, there is a secondary issue which does not appear to have been discussed in any of the survey reports. The issue is what level of positive attitude is necessary or important so that there are no barriers to the continued health and growth of the sector? Is it sufficient for one in five UK adults to encourage their children to have a career in manufacturing? For many of the reports without either a sense of a threshold above or below which the attitudes have an impact or a comparative sense of support for other industries it is difficult to draw conclusions other than where the response rate is either extremely high or extremely low.

The survey data that we have reviewed in this report spans from 1996 to 2012, with a relatively even spread across that period. Some of the data is now out of date and so care needs to be taken that old messages which no longer hold are not carried into the ongoing policy discussion. It may also be worth the Foresight considering if there is merit in a commissioned survey or partnering with, for example You-Gov Cambridge to have a longer baseline with its primary focus being manufacturing as opposed to engineering.

Finally, the lack of academic work that focuses on the perceptions of and the impact of those perceptions on manufacturing may indicate a gap that requires cross research council attention. A small programme co-funded by the Engineering and Physical Sciences Research Council (EPSRC) and the Economic and Social Research Council (ESRC) could address these issues and provide key input into future policy discussions on the future of manufacturing.

6.3 Summary

The characterisation of manufacturing as dirty, dangerous and dull, along with the narrative that there is a significant problem with how especially young people view manufacturing, appears to be strongly established within policy debate in both the UK and the USA. However, the evidence base provided across the policy documents is weak and does not acknowledge that there is a two part problem – that the public may have a negative image of manufacturing but that this may not overly constrain the necessary supply of talented labour entering manufacturing. Whilst this report is mainly focused on

the public's perception of manufacturing, there is also an important and open question on how policy makers are structuring this debate and whether they have focused on a problem without having sufficient evidence to be definitive on the issue. It is hoped that this paper provides a foundation for this debate to move forward and to encourage further work to develop a stronger evidentiary base on the perceptions of manufacturing.

References

- Banham, J. 1992. How to strengthen the UK's manufacturing base. *Engineering Management Journal*, February 1992.
- Benedetti, O., CLEGG, B., KAFOUROS, M. & NEELY, A. 2010. *The Ten Myths of Manufacturing*. London: Advanced Institute of Management Research.
- BIS 2010. *Manufacturing in the UK: Supplementary Analysis*. Department of Business, Innovation and Skills.
- Boaz, A. & GOUGH, D. 2012. Deep and wide: new perspectives on evidence and policy. *Evidence & Policy: A Journal of Research, Debate and Practice*, 8, 139-140.
- Brynjolfsson, E. & McAfee, A. 2011. *Race against the Machine: How the Digital Revolution Is Accelerating Innovation, Driving Productivity, and Irreversibly Transforming Employment and the Economy*, Boston, Digital Frontier Press.
- BVCA 2011. *BVCA Private Equity and Venture Capital Performance Measurement Survey 2011*.
- Cervi, B. 2008. Missing links. *Manufacturing*, December/January 2007/2008.
- Council for Industry and Higher education 2011. *Great Expectations: Top Engineering and Manufacturing Talent 2030, Creating the Pipeline*.
- Deaves, M. 2004. Can Britain make it? *IEE Manufacturing Engineer*, August/September 2004.
- Deloitte & Manufacturing Institute 2010. *Made in America? What the public thinks about manufacturing today*.
- Deloitte & Manufacturing Institute 2011. *Unwavering Commitment: The public's view of the manufacturing industry today*.
- Department of Business Enterprise and Regulatory Reform 2008. *Manufacturing: New Challenges, New Opportunities*. London: Department of Business Enterprise and Regulatory Reform
- BIS 2009. *Advanced Manufacturing*. London: Department of Business, Innovation and Skills.
- BIS 2010. *Growth Review Framework for Advanced Manufacturing*. London: Department of Business Innovation and Skills.
- Department of Commerce 2004. *Manufacturing In America: A comprehensive strategy the address the challenges to U.S. Manufacturers*. Washington D.C.
- Department of Trade and Industry 2002. *The Government's Manufacturing Strategy*. London: Department of Trade and Industry.
- Department of Trade and Industry 2004. *Review of the Government's Manufacturing Strategy*. London: Department of Trade and Industry.
- Freshminds Research 2010. *2010 Engineers and Engineering Brand Monitor*. London.
- Freshminds Research 2011. *2011 Engineering and Engineers Brand Monitor*. London.
- GE Capital 2010. *High Tech Manufacturing Index Report*. London.
- GE Capital 2012. *High Tech Manufacturing Index Report: High Tech Wave 4 Final Report*. London.

IPSOS MORI 2001. MORI Schools Survey 2001. London.

Lim, S., Platts, K. & Minshall, T. 2008. An exploratory study on manufacturing strategy formulation in start-up companies. The 16th Annual High Technology Small Firms Conference Enschede, The Netherlands.

Livesey, F. 2012. Public perceptions of manufacturing and efforts to rebalance the UK economy. Cambridge UK: IfM, University of Cambridge.

Mclaren, S. 2007. Exploiting popular culture: Exploring pedagogical and motivational approaches for design and technology education. Design and Technology Education, 12.

PCAST 2012. Capturing Domestic Competitive Advantage in Advanced Manufacturing: AMP Steering Committee Report. Washington D.C.: President's Council of Advisors on Science and Technology.

Terry, R. G. 1994. Factors influencing the relative industrial performance of Japan, Germany, USA and UK: Part 3 The changing scene and conclusions. Engineering Management Journal, October 1994.

YOU-GOV Cambridge 2012. Britain in a state of poorly regulated manufacturing decline. London.

Appendix – Survey of professional bodies and societies questionnaire

Many thanks to the individuals within the professional bodies and societies who helped by responding at short notice to our request for input. Below are the questions which were sent as part of the request for input.

1. How in your opinion do the following groups perceive manufacturing (please tick one choice for each group)?

	Very negatively	Negatively	Neither negative nor positive	Positively	Very positively
General public					
Young people (11 – 18)					
Media					
Politicians					
Investors					

2. How would you rate the following sectors' image with the general public?

	Very negative	Negative	Neither negative nor positive	Positive	Very positive
Aerospace					
Automotive					
Biotechnology					
Electronics					
Pharmaceuticals					
Software					

3. How positive/negative is the imagery used in UK print and broadcast media to represent manufacturing?

	Very negative	Negative	Neither negative nor positive	Positive	Very positive
Print media (i.e. leading newspapers)					
Broadcast media (i.e. television)					

4. Which of the following countries do you believe has a more or less positive public image of manufacturing compared to the UK?

	Much more negative	More negative	About the same	More positive	Much more positive
France					
Germany					
USA					

5. How important is improving the image of manufacturing in the UK?

	Not at all	Not very important	Important	Very important	Crucial
How important is improving the image of manufacturing in the UK?					

6. What role can and does your organisation play in improving the image of UK manufacturing?

7. What interventions, in the UK or in other countries, do you believe have been successful in improving the image of manufacturing?

8. What actions does your organisation believe are necessary for government to take to improve the image of manufacturing in the UK?

