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gender balance
in science, technology
& engineering

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Making a Difference – why women in STEM become innovators



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Historically, women have played a significant role in building and creating new innovations across all sectors – but somewhere along the line, something changed. During the Second World War and up until the mid-sixties, women were very well represented and were the largest trained technical workforce of the computing industry. However, as computer programming quickly became a more profitable and cutting-edge profession, the culture changed completely, with women making up just 22% of STEM occupations across the UK and just 13% of management roles in science, engineering and technology in the UK.

We want to bring gender parity back to the UK innovation economy. This report shows that nine out of 10 women have experienced barriers to their STEM-career, with over a quarter (26%) experiencing more barriers than enablers. Additionally, six in 10 (66%) of women working in the UK's innovation economy have had to overcome challenges on their own to succeed in their careers, with just two in 10 (22%) saying they received support from their employers. The top three barriers for women working in STEM in the UK were identified as a lack of confidence (84%), having to adapt to a male dominated environment (75%), and a lack of recognition from senior management (72%).

The report also shows that gender balance is more important now than it has ever been to ensure the UK has a strong, vibrant and globally competitive innovation economy. Improving the ratio of women to men in STEM innovation by just 1% has the potential to increase company revenues in that sector by over £300 million per annum – thanks to diverse perspectives and backgrounds delivering innovation that's more in tune with customers and society.

Most importantly, however, greater diversity is simply the right thing to do.

The opportunity is there for the taking. Many women surveyed for this report, at all levels and in all sectors working in STEM-related careers, said pursuing a career in innovation gave them a feeling of self-achievement (59%), the opportunity to do exciting work (56%) and set the foundations for positive career development (56%). Additionally, the main motivators for pursuing a career in STEM were making a difference, problem-solving and simplifying complex problems, with salary benefits of up to £11,000 more for women working in innovation compared with other careers.

To fulfil those needs and ensure women across the UK benefit from those opportunities, we all need to play our part in delivering the report's goals and recommendations.

At Amazon, we are constantly innovating and continuously seeking to recruit people to work on global innovations. We strongly believe that the best way to innovate is by having diverse teams. In short, innovation is crucial to our success and diversity is crucial to innovation. We commissioned this research, working alongside eight other organisations, with the goal of creating a roadmap for increasing the number of women working in the innovation economy, and we have used the report findings to launch our own action plan to recruit, retain and inspire great female STEM talent in the UK.

So I'd like to thank WISE and the Lord Ashcroft International Business School at Anglia Ruskin University for their work in bringing this report to fruition. I would also like to thank our Women in Innovation Advisory Committee made up of experts across industry for their insights, experience and advice which ensured the final report would provide valuable support to

companies in all sectors with a strong STEM-innovation workforce.

We hope this report helps other businesses develop and hone their own diversity strategies so that together we can build an innovation economy, firing on all cylinders, that's the envy of the world.



Fiona McDonnell
Director, Consumer Retail, Amazon

Summary Findings & Recommendations

- The words *innovation* or *innovator* do not inspire women to get involved in STEM innovation.
- We recommend that we use the language that women themselves articulate such as problem solving, making a difference, improving peoples lives, having a positive, lasting impact and simplifying the complex.
- Schools play a larger role than universities in encouraging women to pursue careers in innovation.
- Women in STEM innovation place personal resilience ahead of all other enablers and over 50% still feel that they are not accepted as a woman in a male dominated world. It is evident that, industry-wide, employers and colleagues could still do much more to create an inclusive and welcoming culture.
- It is often non-linear or later career choices that lead to careers in innovation. Hence we recommend that employers should recognise the complexity and importance of flexible career paths by providing multi-layered opportunities to reskill and develop.
- Furthermore, government policy could support new skills development opportunities by making suitable funding available or establishing a national STEM reskilling programme targeting women.

1.0 Introduction

A growing body of evidence suggests that greater diversity in the workplace positively impacts business performance and profitability by enhancing innovation – one of the 10 pillars in the UK industrial strategy. Innovation in Science, Technology, Engineering and Mathematics (STEM) is important in driving competitiveness and in developing solutions to the great societal challenges. Although we have seen a year-on-year increase in the number of women working in STEM, surprisingly few are involved in innovation.

Which factors explain why some women thrive in STEM environments and become innovators? What are the barriers and enablers of their careers? How do they define their achievements and their contributions to their organisation and society? What could employers, universities and others do to increase the contribution of women to science and technological innovation in the UK? To investigate these questions Amazon and WISE partnered to fund research carried out by a team at Anglia Ruskin University's Faculty of Business and Law and by YouGov in 2018.

This report is a summary of the research findings. The full report - *Inspiring Women in Innovation* (WISE, 2019) along with comprehensive referencing and analysis is available via the WISE website.

2.0 Why Does It Matter?

Innovation is vital for any successful economy, to drive economic growth and deliver national and organisational competitive advantage. It is also crucial for technological development within industries and sectors, and for individual organisations if they are to gain and retain market share. Recent studies of private sector firms have identified connections between innovation and improved financial performance and gender diversity, against a reported background of limited diversity in STEM (UK Government, 2014).

Finding ways to improve innovation rates has therefore been a continuing theme for consultancy reports, especially given the links between successful innovation and financial returns. These reports have shown that **companies with higher diversity do better in innovation**, demonstrated by both the number and types of products brought to the marketplace and to company financial performance (Boston Consulting Group, 2015; Hunt et al., 2015; Hunt et al., 2018). Over the last five years, there have been a number of US and European reports emphasising the benefits women bring to companies through increased profitability, enhanced market share and accelerated business growth by:

- Encouraging the development of new products and services
- Generating products for new markets
- Encouraging the development of improved products and services

Despite this, women remain under-represented in these innovation focussed roles and activities.

3.0 How Did We Investigate?

How Did We Investigate?

This project explored how and why women working in STEM innovation began their careers and remained within the sector.

This project was designed to seek the views of successful female STEM professionals from a range of STEM fields, where participants were selected for their strong track record of innovation. Here 50 semi-structured interviews were carried out with women from 28 different companies. The majority (82%) of participants were between 30 and 60, recognising that we were selecting women with a career track record in innovation. These were accompanied by a large-scale (1,202 responses) online survey distributed to a panel of respondents working in STEM roles, nationally, across multiple sectors.

As part of the one-to-one interviews respondents were asked to identify their own definitions of innovation. In particular, in relation to their own career path and day to day practice. Given the range of definitions seen in the literature, this was important as it provided insights into how individuals regard their work in relation to innovation and whether they define themselves as innovators.

In order to develop a survey with a sound foundation, building on previous, validated research, the research team carried out an extensive literature review. Common factors from these sources were incorporated in the design of the survey, with an emphasis on ways in which female STEM innovators had experienced or demonstrated support, benefit and enablement. Although the process inevitably raised the question of barriers, researchers were interested primarily in how participants had overcome such barriers – their resilience strategies – rather than focusing on the barriers themselves.

The underpinning aim of the project was to deliver information to develop recommendations to identify ways to boost the number of women engaged in STEM innovation. The survey, therefore, also contained questions about how they thought the numbers of women in STEM innovation could be increased, together with the advantages of doing so, based on the benefits they felt they brought to their organisation and to society. In turn, WISE has developed those suggestions to form practical recommendations that individuals and organisations can adopt. These recommendations are in **Section 5.0**.

Definition of 'Innovation'

To select the women that were invited to participate in this research, we have assumed a broad definition of innovation as:

'creation of new products, services, and ways of doing business'

4.0 What Did We Find?

4.1 Non-linear career choices often lead to careers in Innovation

Around a third of the women interviewed described waking up to the possibility that they could find a career route in STEM while they were in administrative or sales jobs. These views and those of the other interviewees led to the development of three pathways to a STEM Innovation career as shown in **Chart 1**.

Whilst over half of the survey respondents (54.9%) identified education, especially primary or secondary school, as a critical stage for a STEM Innovation career – 18.5% did so during later education (e.g., college, university). However, 1 in 4 respondents only considered innovation later during their working careers (25.5%). See **Chart 2**.

Chart 1: Routes to Careers in STEM Innovation

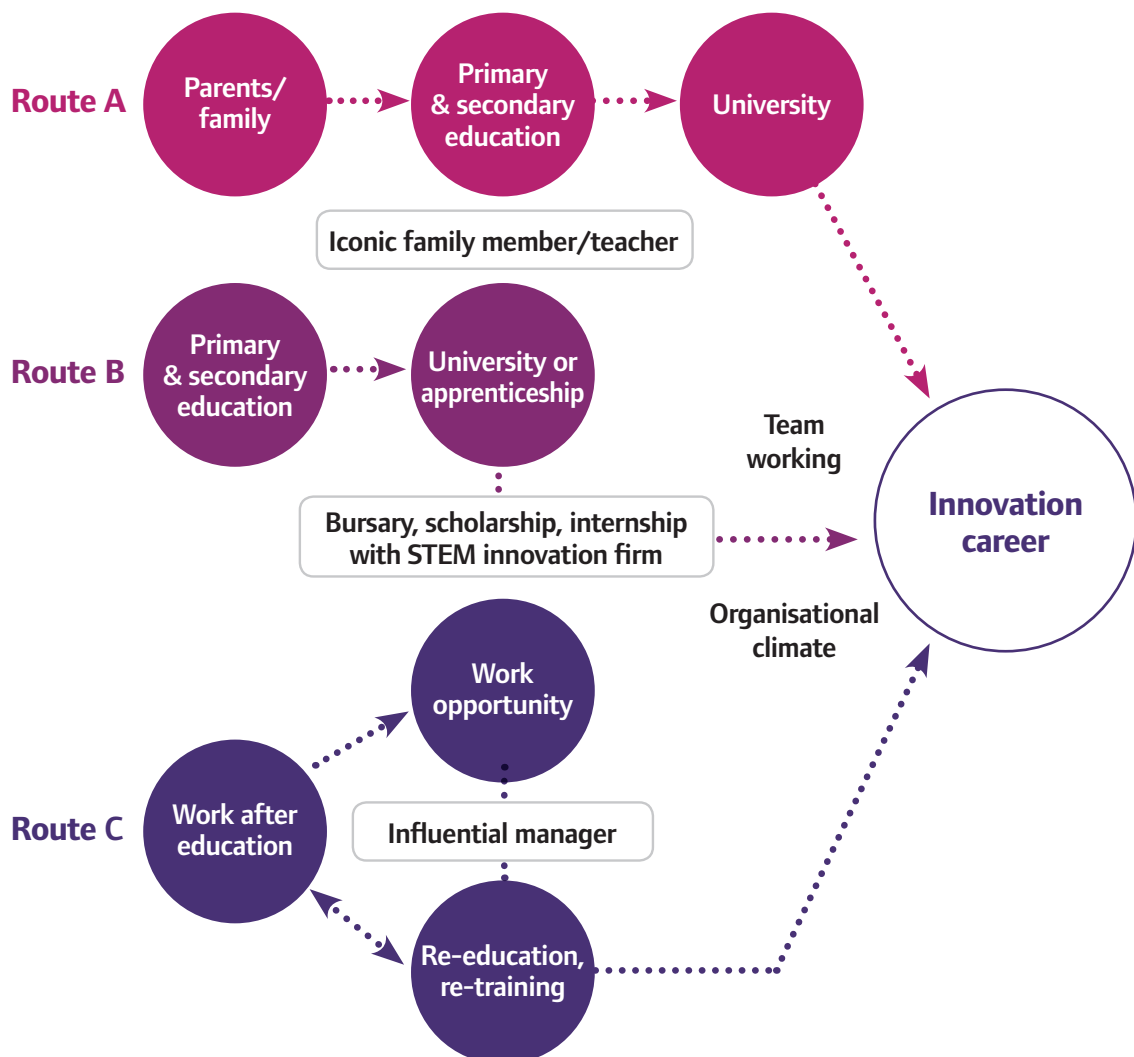
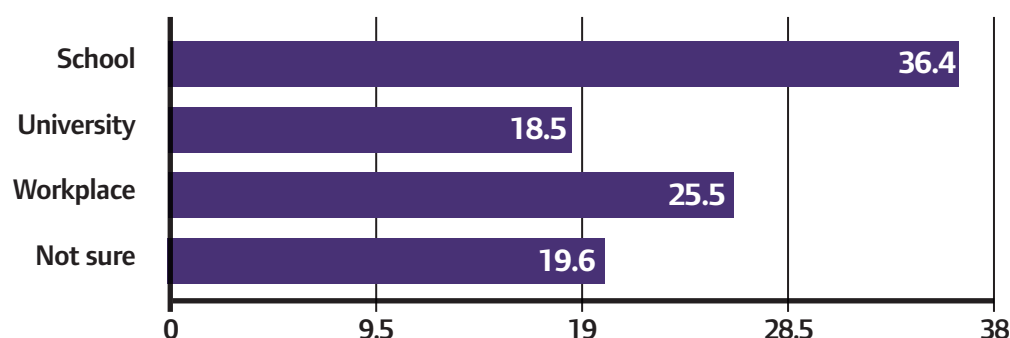


Chart 2: Periods of Influence for Careers in STEM Innovation – % of participants stated



4.2 Determination, resilience and self-efficacy are top enablers

The quotations from the telephone interviews reflect the mixture of enablers identified in the online survey. The respondents cited multiple enablers, with similar patterns across different roles, with one or two differences related to being an entrepreneur or a director, as suggested below. Enablers included:

- Personal qualities
- Organisational aspects
- Education and family

Personal qualities - Of these enablers, personal qualities were cited most frequently, with 59% of all respondents identifying **determination and resilience** and 53.4% **self-efficacy** as key enablers to a STEM innovation career. Self-efficacy is often attributed to entrepreneurs and innovators, as it is seen as necessary for them to be confident about achieving a goal. These personal qualities, together with organisational factors, support the need for a **work-life balance** (44.3%).

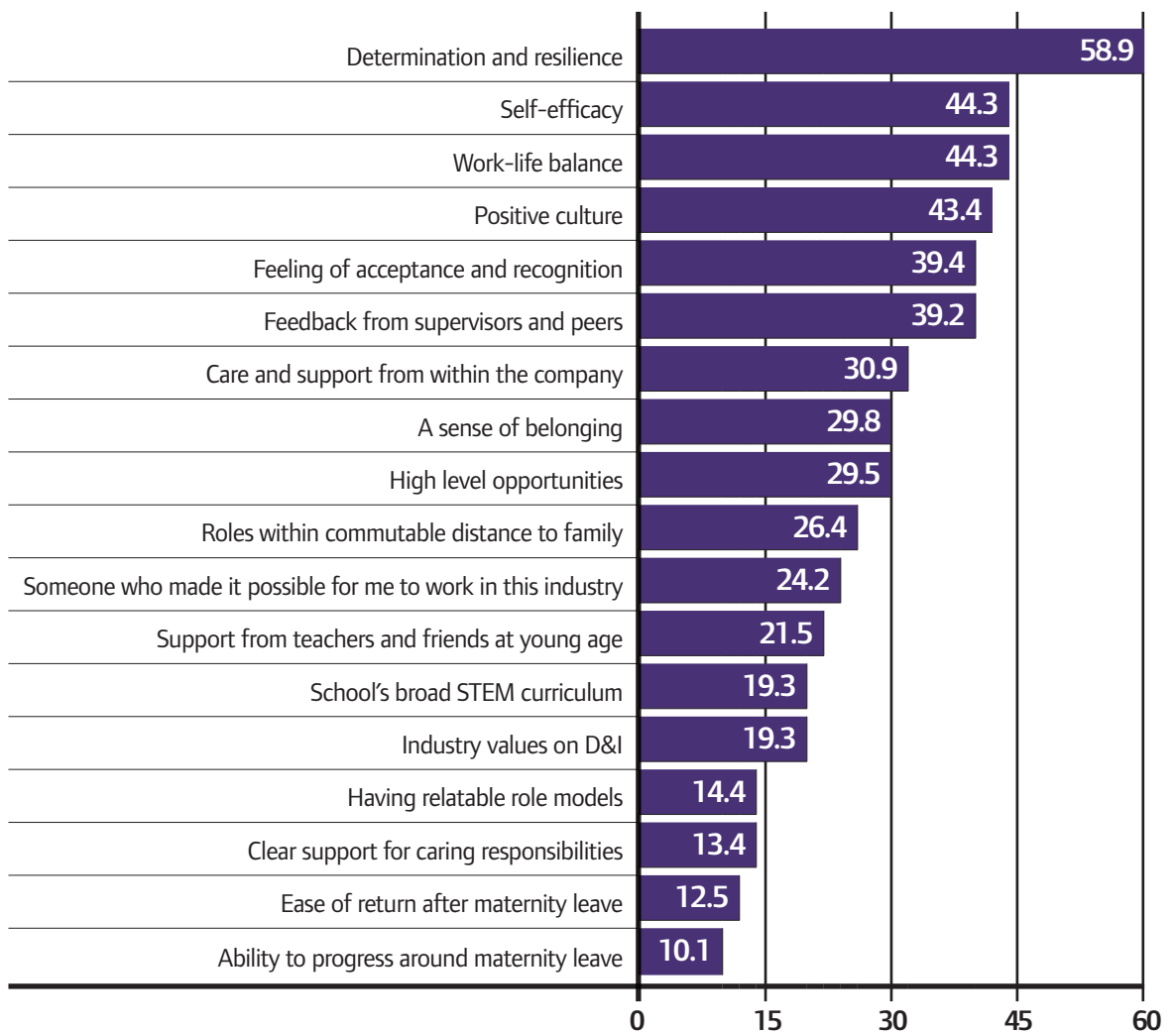
Organisational aspects - Here a positive climate (43.4%), with feedback from managers and peers (39%), and organisational care and support (30%), indicated workplaces that supported women in STEM innovation. An inclusive organisational culture led to the women interviewed feeling valued and respected as a professional. Organisational factors varied with respondent role and included 'having a relatable role model', which was more often cited by directors and innovators as an enabler.

"... it helps to work somewhere positive, somewhere respectful of you as a woman in tech innovation"

Education and family – these were less often cited but included early support from schools through broad STEM curriculum and support from teachers and friends at a young age as well as practical aspects of support for childcare responsibilities during their career.

Chart 3 below, shows the percentage of survey respondents citing each issue as an enabler.

Chart 3: Percentage of survey respondents citing each issue as an enabler

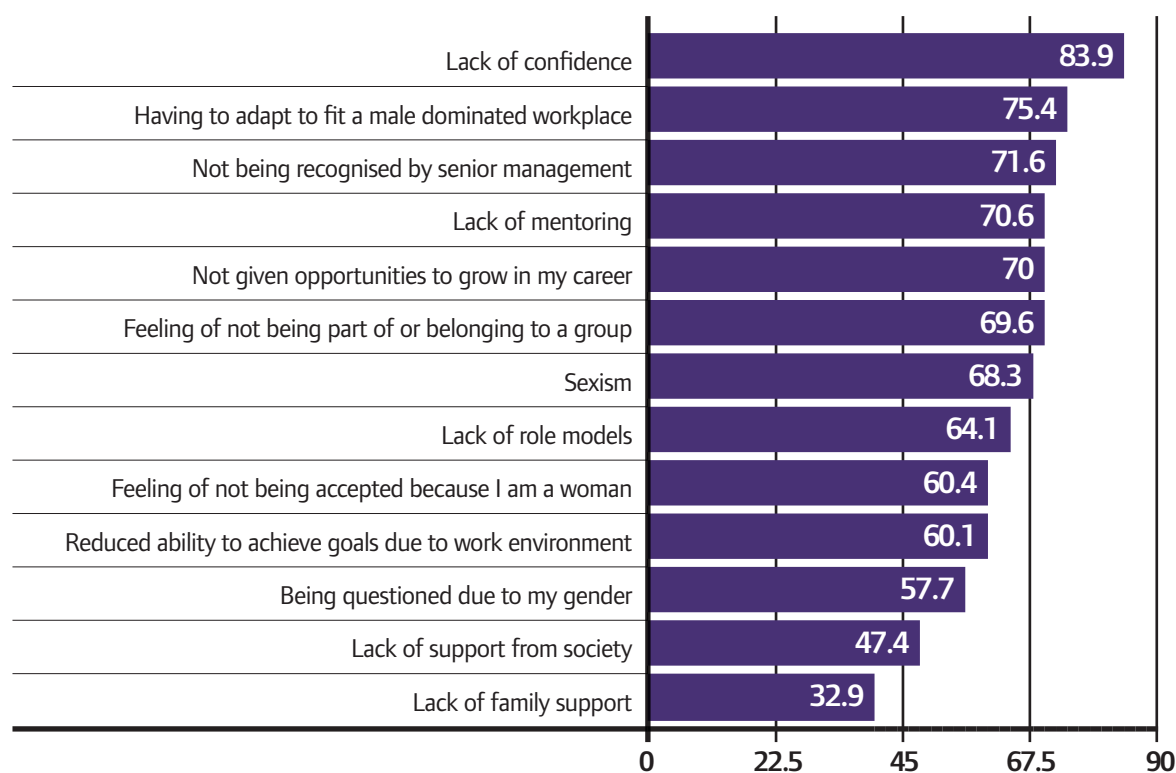


4.3 Confidence still a barrier to many women

Having considered the enablers, the online survey also considered barriers (see **Chart 4** below). While support from society and family were less of an issue, other factors such as career opportunities, mentoring and lack of recognition emerged as important. There is also more evidence of lack of confidence and having to adapt to fit into a male dominated workplace.

More than half (60%) of those responding to the survey felt they had a reduced ability to achieve their goals; and more than half (60%) feel they are not accepted because they are female.

Chart 4: Percentage of respondents citing each issue as a barrier



4.4 Employers and colleagues could work harder to welcome and support women

In balancing enablers and barriers, however, there was better news. **Although 93% of women had experienced some barriers, 36.6% had experienced more enablers than barriers and only 26.3% had experienced more barriers than enablers**, as seen in Chart 5 below.

Chart 5: Enablers v barriers

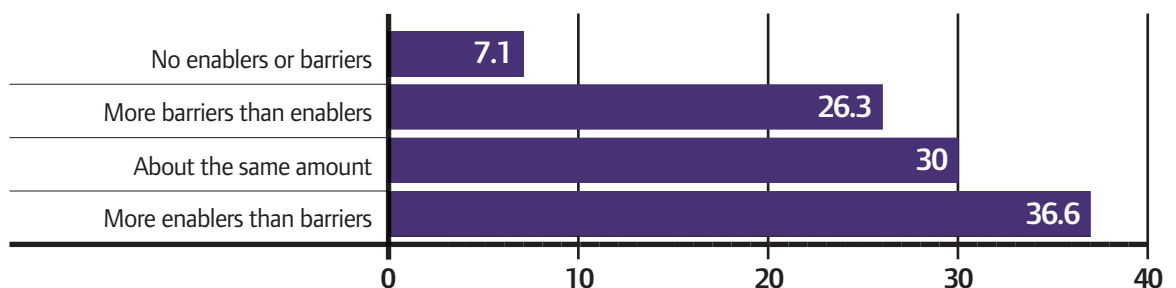
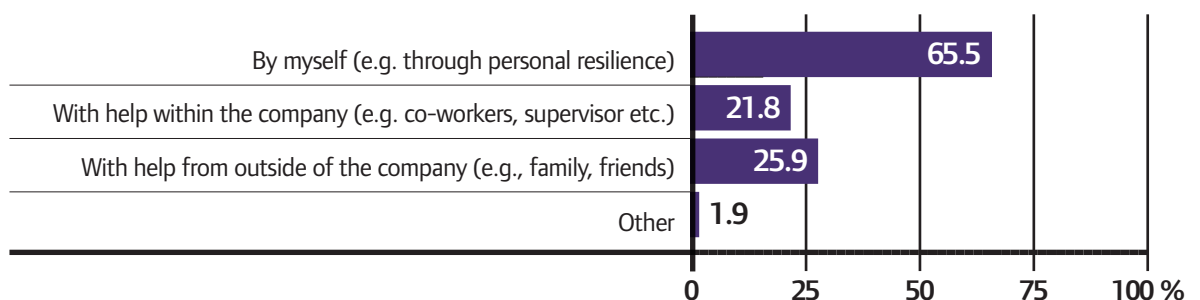


Chart 6 highlights the importance of personal resilience in overcoming barriers. The fact that only **22% had received help from their employers in overcoming barriers** shows that organisations, line managers and colleagues

have a real opportunity to make a difference, by creating a climate where women are welcomed and encouraged to the same degree as their male counterparts.

Chart 6: How were barriers overcome?



4.5 The word 'Innovation' does not inspire women to get involved with STEM

"We don't like to give ourselves big names like 'innovator'."

When talking about innovation, women do not readily self-identify with the term innovator as seen in the low numbers in the online survey claiming the role. Although the online survey respondents were all women working in Innovation, Science and Technology, only 4.7% considered themselves to be innovators while, when asked in which type of innovation they were involved, 86.4% agreed they were involved in innovation with 41.7% involved in one type of innovation, and 44.7% involved in one or more types of innovation (e.g., service, product, business, technical).

Similarly, in the telephone interviews, only three people identified as innovators immediately. With some discussion, where respondents were careful to qualify what innovation meant, it was only then that they accepted that they might be innovators. At the heart of their alternative definitions for innovation is the idea that **"innovation means solving problems in better ways so you're making things easier and less complex"**. Or even **"innovation means making a difference, even if it's a small difference, to people"**. Even those with patents did not identify themselves as innovators.

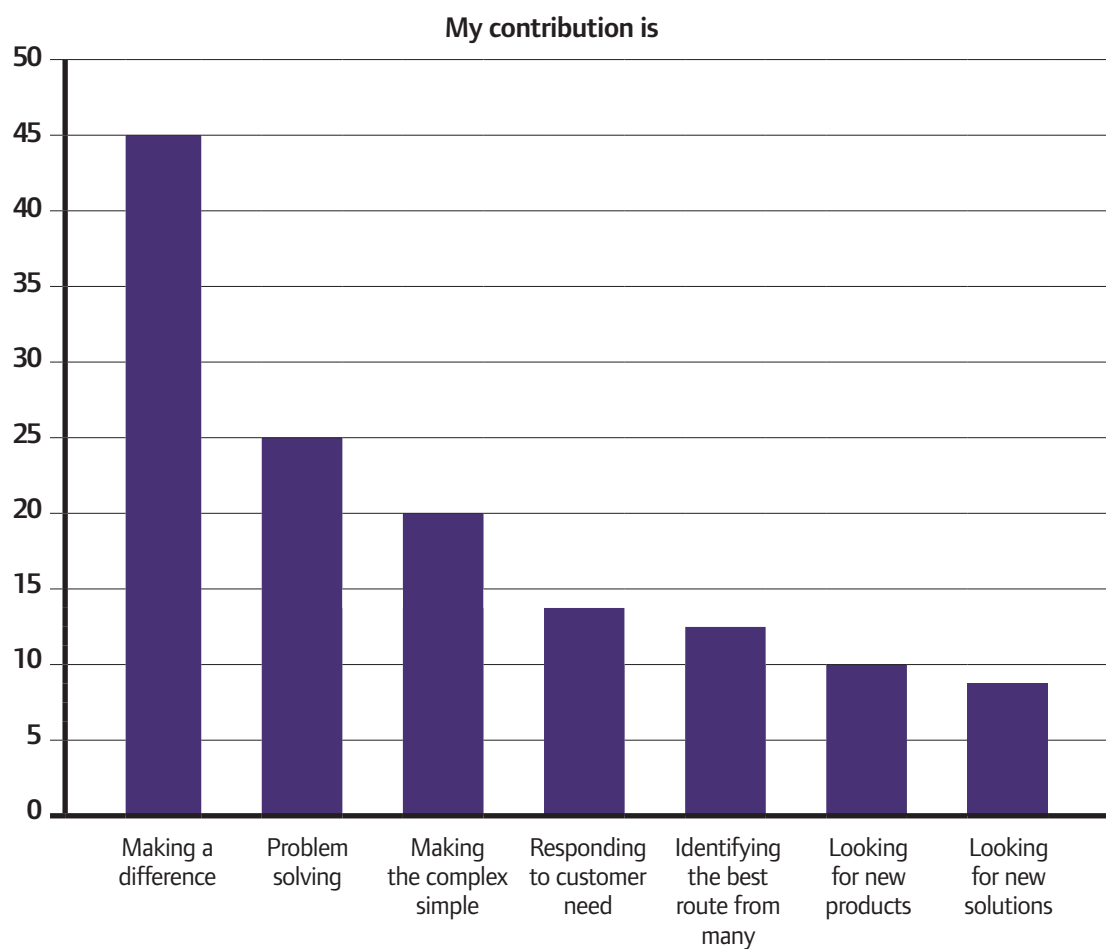
The claim to be an innovator was usually prefaced with definitions around their work that would enable them to use the title as participants felt that the term had become inflated by major players in the tech world and with Nobel-winning scientists and so most hesitated to claim the title straight away.



4.6 Innovation means 'Making a Difference' to most women

Analysing the language used by women during the research, 'Making a Difference', 'Problem Solving' and 'Making the Complex Simple' were the three most frequent ways to articulate working in innovation. **Chart 7** shows further detail.

Chart 7: Number of participants defining contribution



4.7 Women see ‘Self Fulfilment’ and ‘Value to Society’ as key benefits of working in Innovation

Women enjoy working in STEM innovation because of individual fulfilment in terms of ‘self-achievement’, ‘having exciting work’ and ‘feeling useful’ rather than primarily for salary or status. Being able to work flexibly, having autonomy and being respected by co-workers day-to-day and in expressing opinions are also important to these online respondents. The full breakdown is given in **Chart 8**.

“The rewards for me of this career are that it’s been challenging and exciting. There is never a dull moment! The breadth, the variety, and the different people you need, from different sectors. It has been very interesting and it’s not over yet.”

4.8 Women in Innovation benefit from a salary uplift

The annual salary of women working in STEM innovation, whether part time or full time, is consistently £11,000 – £16,000 higher than for female workers in all sectors.

This was not cited highly by the women themselves but emerged through statistical exploration of survey data compared to national sources.

Despite the figures on salary benefits, women ranked salaries below many other benefits questioned in the survey.

Chart 8: Benefits from STEM innovation work

Benefit	% agree
Feeling of self achievement	87.5
Having exciting work	81.5
Career development (e.g. learning opportunities)	81.4
Feeling useful to society	76.7
The status of my role/industry	76.0
Autonomy (i.e. being able to make my own decisions)	74.7
Being respected by co-workers	74.1
Being able to express my opinions	74.1
Flexible working	70.2
Being able to express my creativity	69.1
The salary	65.0
Work-life balance	63.3

“I look at the figures now for that disease and think, OK, still work to do, but that decrease is partly due to our work.... it’s a great feeling.”

4.9 Business and society benefit from more female innovators

In earlier studies, such as the Boston Consulting Group (2018) survey, companies with above-average total diversity had both 19% higher innovation revenues and 9% higher earnings before interest and taxes (EBIT) margins, on average. The Boston Consulting survey also found that the presence of enabling conditions for diversity – such as fair employment practices, participative leadership, top management support, and open communications – is worth up to 12.9% in innovation revenue.

The impact on company innovation and competitiveness was also suggested by respondents. While this survey focused on the individual rather than analysing company performance, the key benefit these women felt that they brought to the workplace was in innovation. They felt that **diverse teams meant better innovation, better access to wider ideas and resources and better implementation in the market.**

4.10 Technology, health and energy were identified as great places to work

Technology companies

Technology companies were particularly singled out as spaces to be creative, to be able to engage in innovative activities, problem-solving, pursuing ideas, refining new products and developing new ways to do things. The physical environment was set up to encourage teamwork and the culture embedded team working in how things were done.

Energy and health companies

Energy and health companies were seen as places to make a difference. In energy companies, participants innovated to respond to changing markets in energy while within the context of the challenges presented by climate change and the need for carbon reduction.

In health related firms, participants could draw a line between their own contribution and the improved lives of target groups. The companies in each case were ‘prepared to change’ ‘able to respond quickly’ and ‘focused on team work’.

“I just loved maths and physics. I didn’t think it would lead to anything particularly but when I started work in an energy company the possibility of making a difference to people has really hit me as something I could do... I think that’s a type of innovation.”

5.0 Recommendations

5.1 When promoting STEM Innovation use the language women themselves use

The language around innovation often focuses on the individual and emphasises ‘innovation’ as a singular activity. The label of innovator is also often associated with high profile Global Tech leaders most of whom are men. The women in our survey, on the other hand, stress their roles as problem solvers for customers, as simplifiers, (taking a complex issue and reducing it to a simple solvable problem). They are motivated by the idea of making a difference whether this was enabling customers to have a better experience or finding a cure to a disease.

“I know I’ve made a difference in this role in getting cures identified and in getting them taken up and used, I’m so lucky to have that experience.”

This research shows how important the language we use can be. Specifically using the vocabulary women themselves use to describe themselves and their work will attract more girls, women and a more diverse audience generally to engage with innovation related topics. We suggest we have to change our tune and use different language to disrupt the conversation. The quote below illustrates how important stressing the collaborative nature of innovation might be for the future. A guidance note is given in **Appendix A**.

“It might be more appealing to boys too to stress the team working, the diversity and the difference you make - because that’s what our workplace is about, it’s no good if people all come to be a star and work on their own.”

5.2 When speaking to children about STEM make sure it has an impact on girls

Our research found that school is the place where most women currently in innovation cultivated an interest and motivation to pursue STEM innovation related careers. This underlines the importance of inspirational teaching, effective careers advice, STEM outreach and visibility of role models throughout both primary and secondary education. We also know from our respondents that teachers and parent are highly influential in subject and career choices.

Make sure you engage the girls

There are already a huge number of outreach programmes which bring STEM activities into the classroom, that aim to give children exposure to innovation, design, creative problem solving and similar activities. WISE recommends that schools and employers working with schools should use our My Skills My Life resource alongside existing outreach activities to ensure girls feel these careers are for them. Ensuring that you have a set of great female role models to connect with the girls and show them how fulfilling these careers can be is a key part of this engagement.

Ensure you engage parents not just children

Our research confirms that parents are more influential than friends, media or celebrities. We recommend outreach which also engages parents (particularly mothers in the case of girls). For example, our My Skills My Life resource also includes a Mother & Daughter Session.

Review outreach programmes

We recommend that you review existing outreach material in line with the language recommendations given in this report and use the vocabulary we found resonates with women. Participants in our research also encouraged businesses to ensure that they started engaging with children in primary school, not just secondary school, and across a range of socio-economic backgrounds.

Check out specific Girls in Innovation activities

We also recommend that employers partner with those existing outreach programmes that acknowledge the importance of women in tech and the need to stimulate interest in innovation not just STEM in general. For example, InnovateHer: www.innovateher.co.uk

“It’s not like it’s one thing... I had a truly inspirational Physics teacher, but I don’t think I’d have embarked on innovation without the way my parents brought me up to question and experiment, to try things out...”

5.3 Higher education can do more to stimulate careers in Innovation

The research found that universities were not as influential as schools or workplaces in stimulating careers in innovation, which means there is an opportunity for universities to make a greater impact in the future. Suggestions on how to improve this are outlined below. WISE has also created a Route Map in **Appendix B** which shows how these steps work towards the target of more women in innovation.

NEW IDEAS TO TRY:

Introduce cross-discipline projects

By creating design or business experience projects that encourage departments to work together in research, design and delivery can give students an energising opportunity to

develop fresh ideas in a team environment and learn from each other. This also gives the opportunity for more heavily female dominated sciences, like biology and chemistry, to come together with engineering and computer science to expose more women to innovation across STEM sectors.

Establish campus ambassadors

We encourage universities to work even more closely with companies known for innovation to create student ambassadors who can be the source of encouragement and knowledge about roles within the organisation. Ensuring there are both male and female ambassadors is key to creating an inclusive image of your business. Provide training for ambassadors so that they are aware of the implications of unconscious bias and the influence of language in influencing women’s career choices.

EXPAND EXISTING GOOD PRACTICE:**Arrange open evenings and tours**

Our research showed that it was interest around the subject itself and the technology applied that most encouraged women to enter STEM. Taking that interest beyond the classroom to see STEM in an innovative context will help students to see the opportunities to make a difference and influence the future through innovation. We recommend that university departments create partnerships with the most inspiring and innovative companies and facilities to enable them to deliver real world tours which inspire undergraduates. For example, universities that join WISE can make connections with STEM employers that offer open days and tours. Making these accessible to non-STEM undergrads also has the potential to influence recruiting patterns.

<https://www.aboutamazon.co.uk/amazon-fulfilment/tour-an-amazon-fulfilment-centre>

Invite business role models

Ensuring students have access to business contacts, advisors and role models allows for more relevant discussion of innovation and entrepreneurship. Ensuring that women are invited as guest speakers, lecturers and mentors will inspire other women and give visibility to “innovators” they can relate to.

https://warwick.ac.uk/fac/cross_fac/enterprise/hic/

Introduce a STEM based electives and options framework

Some universities already offer a wide range of innovative STEM based voluntary modules and options to non-STEM students, but it would be good to see this best practice applied more widely. These could include coding/create your

own app, robotics for all, sustainability and environmental design, house of the future.

<https://leedsforlife.leeds.ac.uk/Broadening/Index>

Involve students in incubator projects

Build practical links between university incubators and students in the relevant facilities. Encourage networking, incentivise collaborative projects, work placements and even internships.

<https://www.kcl.ac.uk/entrepreneurship-institute/entrepreneurship-institute-homepage.aspx>

Establish university based internships

Look out for potential innovation focussed internships that can give new graduates an opportunity to work across both academic research and the business environments.

<https://warwick.ac.uk/fac/sci/wmg/careers/gs/>

Design careers service programmes that focus on innovation

Creating specific opportunities via university careers services can ensure that the widest range of undergraduates have visibility of business innovation related programmes which in turn can broaden the type of applicant that might be exposed to the STEM workplace.

<https://www.plymouth.ac.uk/student-life/your-studies/academic-services/careers-and-employability/stem-graduates-into-business>

<https://www.southampton.ac.uk/careers/students/work-experience/business-innovation-programme.page>

5.4 Employers should recognise the importance of flexible career pathways

The role of employers in providing an inclusive culture which encourages innovation from all employees is reinforced by the research. The evidence shows that there is a serious and significant gap in support for women who do not feel accepted by their colleagues.

It was also evident that employers must be much more aware of the importance of flexible career paths and influential opportunities if they are to encourage more female innovators. We encourage employers to look within the people they already have in the business, who may not have previously had the opportunity to explore roles in innovation, to find a new stream of talent. Promoting a culture of life long learning will also encourage the whole workforce to seek out new development opportunities and keep workforce skills relevant in an age of huge technological change. Recommendations arising from these findings are given below.

WISE has also created a Route Map in **Appendix B** which shows how these steps work towards the target of more women in STEM innovation careers. The Route Map is intended to be a discussion guide to explore how an employer might develop and expand its activities to both attract, develop and retain women in innovation focused roles.

NEW IDEAS TO TRY:

Create graduate schemes with innovation modules

It has been identified that higher education is not particularly effective in opening the eyes of undergraduates to innovation-focused career pathways. Instead women became gradually aware of their interest in these types of roles. Companies might jump start that process and stimulate different career routes by either

showcasing innovation-based activities during graduate scheme rotations or by having a graduate scheme with a designated innovation pathway that included involvement with product and service development, stimulating blue sky thinking and enhancing creative thinking approaches.

Ensuring a gender balanced intake on this specific pathway will expose more women to innovation in action. Partnering with an academic institution will also boost industry/academic relationships as well as an innovative mindset.

Give time for secondments and rotations

As with the concept of graduate scheme rotations, secondment to an innovation-focused department for a period of time will not only open eyes to other possibilities but also ensure new perspectives are regularly brought into the 'Imagineering' processes of the organisation. Having a structured process for secondments means that men and women will benefit equally rather than having an opaque ad hoc system when a privileged few are more likely to gain access to opportunities. It is suggested that companies and individuals would benefit from the use of business rotations (similar to a graduate scheme structure) at various mid-career points which would improve knowledge sharing and boost innovation.

Introduce non-STEM Foundation Programmes

Non-STEM foundation programmes or non-cognate programmes identify roles in the business that do not require higher level STEM qualifications, which can be filled by those from a non-STEM background when given supplemental foundation training. It is a powerful way to expand your accessible talent pool and redirect non-STEM applicants into STEM companies and roles. For example, social scientists becoming project managers in

construction or analysts in tech companies. Even in technical innovation-focused teams, people without STEM qualifications can still contribute at a high level by challenging and exploring conventional wisdom and disrupting company paradigms. In a team environment where technical specialists provide the necessary back up not everyone needs to be a technical expert.

EXPAND EXISTING GOOD PRACTICE:

Make apprenticeships available to mature candidates

Providing access to apprenticeships for mature candidates could help to capture and develop promising candidates with the right mindset, particularly women in support roles, who might be interested in progressing into STEM roles. A number of women in our research had found their own way to retrain but apprenticeships that allowed them to stay within the business to work and train would have provided another option. Employers could also look at ways to maintain the salary levels of those who wish to retrain.

Qualifications such as the Degree Apprenticeship in Digital Innovation could be expanded to provide an inclusive route for mature candidates from other backgrounds.

<https://ukcareers.ey.com/students/insights/ey-degree-apprenticeship-in-digital-innovation>

<https://www.goldmansachs.com/careers/students/programs/emea/technology-apprentices.html>

Make returning to work easier

Our research showed that for women in STEM Innovation the ability to return to work easily after maternity leave was ranked highly amongst the factors that companies could influence. As well as returning with ease to your original employer, women who have taken a longer career

break may seek to join other companies that demonstrate the positive culture and supportive workplace they identify as important to their success.

A dedicated returners programme to capture well qualified female returners helps access talent and support the candidates, gives companies an edge in the skills market.

https://www.amazon.jobs/en/landing_pages/awsreturners

Introduce new skills programmes

A third of the women interviewed in our research switched to STEM innovation roles mid-career and often used their own money and resource to do so. Company specific programmes, such as the Sky Get into Tech programme, Amazon Restart and the BBC Step into Tech programme, should be replicated more widely. WISE also recommends a national new skills training programme targeting women to both boost female participation in STEM and create improved gender balance in innovation.

<http://getintotech.sky.com>

<https://aws-restart.com/>

Provide career development support for women

Our research illustrated that women who had made a career in STEM Innovation have had to show considerable resilience to progress in their career and innovative pursuits. This highlighted that even in the more contemporary workplaces of the new technology sectors we must still pay attention to retaining, developing and supporting these women.

The importance of access to mentoring, peer support and career development coaching along with the opportunity to network with others and connect with credible role models must not be underestimated.

Provide training on managing diverse teams

Organisations that also invest in training employees and line managers in how to work in diverse teams are ensuring everyone has the opportunity to perform to the best of their ability. Research finds that it requires 30% of the team to be female to demonstrate positive performance improvements (Dahlerup, 1988). So when women are few and far between, try to give them opportunities that bring them together in mixed teams.

https://wisecampaign.scdn3.secure.raxcdn.com/wp-content/uploads/2018/05/Leading_and_Managing_Diverse_Teams.pdf

Involve women in new projects

Our interviews highlighted that, for many women, their involvement in true innovation came first through some type of special project or assignment, not as part of their day job. Often the individuals had asked specifically to be involved which emphasised the need for transparency around these types of potentially career altering opportunities.

Identifying ways to involve more people in these types of projects (new product ideas or problem solving a client issue, for example) opens up the experiences of problem solving and making a difference to a wider audience.

Give women the chance to retrain

The opportunity to boost relevant skills through retraining or skill enhancement should be made available at all stages of a career not just after career breaks. This can be particularly powerful in stimulating involvement in innovation as well as harnessing transferable skills. Numerous postgraduate courses that focus on innovation and digital skills can provide a new dimension to a CV and the experience of learning and developing with a cohort of others is often stimulating and beneficial. Online study options

that minimise attendance requirement will ensure that those with caring commitments are not excluded from participating.

Around a third of the women described waking up to the possibility that they could find a career route in STEM while they were in administrative or sales jobs. This involved significant effort on their part, re-enrolling at school, night school or university, taking extra classes to try to address the gap in key subjects like mathematics. WISE statistics confirm that only 8% of women educated in the UK leave school with an engineering or technical qualification and so there is a vast untapped future talent pool to access.

Other schemes involve sabbaticals (short or long) to attend conferences, study, visit companies and develop ideas. Offering these opportunities to both men and women (two per year or alternately, perhaps) can bring new female thought leaders to the fore.

Ensure company innovation programmes are inclusive

The best way to create both an innovative and inclusive culture is to build it in from the very beginning. For many companies both innovation and diversity are part of their DNA, but for others there are big challenges in creating a diverse workplace with an inclusive culture that in turn stimulates innovation. Many companies use innovation in their vision and mission statements and do not connect this to actions to improve the representation of women or develop an inclusive workplace which would in turn drive innovation.

For those companies employing culture change programmes to drive innovation it is imperative that they are linked to diversity and inclusion. For example, where companies are using an incubator approach to stimulate and develop new ideas it is essential to create an

inclusive environment that allows ideas from under represented parties (which includes women in most STEM businesses) to be articulated and supported. This means giving space and time to encourage women to participate, ensuring, where practical, any screening or assessment panel is gender balanced and that female mentors and coaches are in evidence. Having specific numerical targets for the women involved in the programme will help drive progress. Team leaders also need to demonstrate inclusive values and behaviours at all times.

Working with partners and organisations in your supply chain to ensure they have diverse teams to work with you on products and initiatives will help create the best possible environment for innovation. Research has shown that diverse teams, by nature, do not create the immediate easy consensus of a homogeneous group. It takes time to build rapport and recognise all the voices that can contribute. It is recommended that organisations train their leaders to manage diverse teams as this enables them to unlock the diversity innovation dividend more readily.

5.5 Policy recommendations

Overall the research supported the view that it is education and employer organisations that can have the biggest influence on the numbers of women involved in innovation focussed roles. However, it was acknowledged that government policy could play a part in stimulating outreach activities to attract and engage a broader mix of candidates for future STEM careers including an awareness of the role of innovation.

Give financial incentives for STEM innovation outreach

Many of the respondents recommended that financial incentives, via tax breaks or grants, for companies who carried out meaningful and effective STEM engagement, should be made available. Giving companies recognition for their impact in this arena would also be an incentive.

Ensure outreach complies with best practice to engage girls and women

By ensuring programmes meet good practice criteria, such as gender balanced language and targeting a diverse audience, an increased number of girls will be introduced to careers in innovation. WISE supports this approach and our research shows that we should change the narrative used in STEM outreach and educational programmes, many of which are publicly funded, to resonate with future female innovators.

Make funding available to develop reskilling programmes

Providing access to funding that can be used to develop the type of education, training and reskilling programmes outlined in **Sections 5.2** and **5.3** will allow more women to retrain for roles in innovation.

Appendix A: Language of Innovation

1. Emphasise the fun and creative side of science, tech and engineering.

creative inventive imaginative fun

2. Explain the more reflective aspects of careers in innovation.

listening understanding intuitive patient

3. Recognise the importance of team working in innovation.

team work sharing friendly communication

4. Understand how future innovators see themselves and welcome them.

collaborative co-operative resourceful practical

5. Make different models and definitions of innovation visible so girls can relate to them.

in medicine
& healthcare in everyday
tech in renewable
energy in cutting
edge science

6. Don't overuse the word "innovation" – instead use:

solve problems new approaches influence the future
improve lives make a difference

7. Value all inputs to innovation, showcasing diverse teams selected for insight and values not just technical skills. Use inclusive language to communicate this and to recruit talent.

valuing community supportive
developing inclusive

8. Be creative and disruptive with language to stimulate diverse candidates to get involved and recognise their view of innovation.

new perspectives listening curious
motivated simplifying

Appendix B: Routes to Careers in Innovation

Appendix B

Actions for Higher Education



My route into innovation

Bhavagaya Bakshi (or Bea as she's known) graduated in Medicine from King's College London. After 10 years as a doctor in the NHS, Bea co-founded C the Signs – a digital healthcare company using Artificial Intelligence to accelerate early cancer diagnosis. Bea was offered a place on the King's College London Accelerator

Programme to develop her entrepreneurial skills and has now won many awards for tech innovation and social change. She continues to work as a GP and a clinical tutor at King's College London whilst scaling the C the Signs technology throughout the NHS, having completed clinical trials last year.



Actions for Employers



My route into innovation

Hana Sulaiman studied English Literature at university and took a non-technical role at TSP Projects after university. When TSP started to recruit people with no technical qualifications for entry level technician roles she jumped at the opportunity.

After two years technician training, Hana was offered further study support to become an engineer. She is now a Track Design Engineer – finding solutions to overcome challenges in future railway design.



We would like to thank our Advisory Group members for their insight, input and support for our *Women in Innovation* research project and the recommendations detailed in this report.

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Research Partners

The Lord Ashcroft International Business School at Anglia Ruskin University

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