HFM TALENTINDEX Online Assessment

Are engineers ready for change?

Research Learning Agility & Engineers

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Opening

This is the year of research, a year in which compelling ideas and insights are shared with all! Having conducted multiple research analyses for clients, we at HFMtalentindex want to share with the HR community the information and insights we gained through these research requests. Each article focuses on one topic, followed by an interview with a person of interest working within the HR work field. This is meant to infuse hard data with a more human touch! The article mainly focuses on the research question and what the results mean, the interview can place these results in a more relevant real life context.

Introduction

Learning Agility & Engineers

In April, HFMtalentindex, working with the Royal Dutch Institute of Engineering, gathered data on 542 engineers. Engineers volunteered to participate in the study by signing up online and filling in a Learning Agility Indicator assessment. The assessment consisted of a personality and motivations questionnaire. The main goal of the analysis was to investigate how learning agile the group of engineers were and whether engineers were ready for the ever changing and uncertain future within their profession. Due to the nature of the assessment, the analysis could also focus on the engineer's strongest competencies and their main motivations in the work place. In conjunction with demographic information regarding the engineering group, specific differentiating factors were also included in the analysis, such as gender differences or differences in function levels.

Of the 542 participants, 89% of the group were male, with 61% of the total group having completed a university degree, followed by 38% having completed a higher vocational education; the last 1% consisted of candidates who had completed a lower vocational education. The breakdown observed in the data set is an accurate representation of the engineering demographic within the general population (Kamphorst, Hofman, Jansen, & Terlouw, 2012; Kamphorst, Hofman, Jansen, & Terlouw, 2015). With this knowledge, there is a sense of confidence that the following results truly reflect the readiness of the engineering population for the future[1].

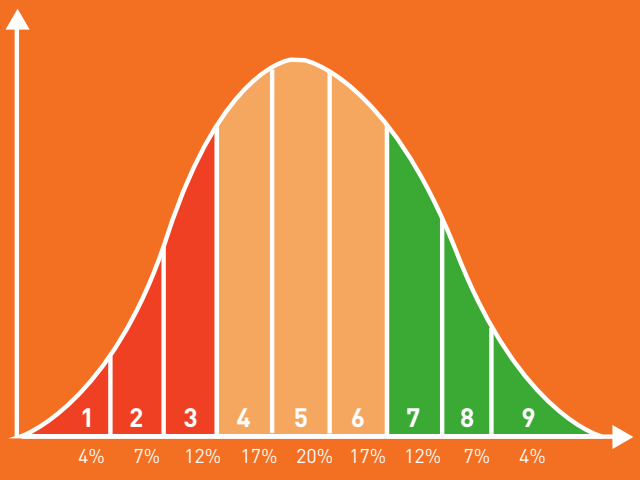
[1] Earlier publications (in Dutch about) this study: Magazine De Ingenieur and Newspaper NRC

What is Learning Agility?

Before starting on the results, what is Learning Agility? It is the ability for someone to rapidly develop new effective behaviour based on new experiences and to easily move from idea to idea within and across experiences. Learning Agility is comprised of four domains and one transcending factor[2].

Basic research concepts

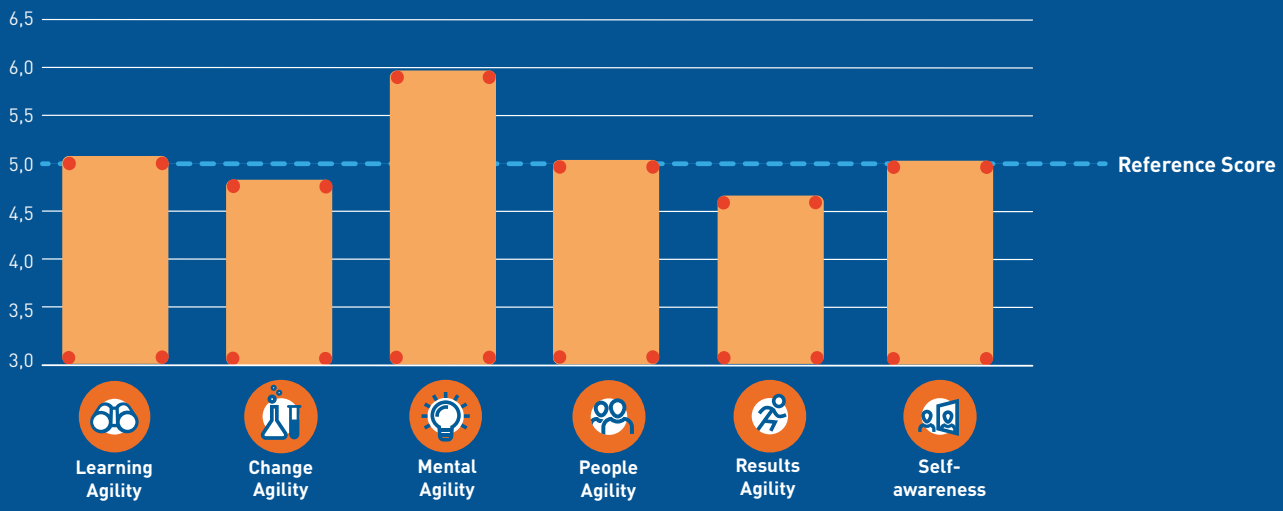
Before getting to the results, we will explain some basic concepts to put the results into an understandable context. The scores on Learning Agility and its underlying domains are on a 9-point scale. This is also the case with the individual's personality, motivations, and competency scores. Think of the 9-point scale as a bell curve, that gives an indication on how a person scores in relation to the general population. For instance, scores 1 to 3 represents 23% of the population that score lower than average. Scores 4 to 6 represent an average score and consists of 54% of the population or in other words, the majority of the population. Scores 7 to 9 represent the top scoring individuals, which consists of 23% of the general population.



[2] For more information about the Learning Agility domains, see page 14

Total Group Results

The general population, i.e. the reference group, scores an average of 5 on Learning Agility, but also on the four underlying Learning Agility domains and the one overarching domain Self Awareness. Looking specifically at Overall Learning Agility, the engineering group has an average score of 5, which reflects that of the general population. This means that the engineers are not particularly strong or weak on overall Learning Agility, they are average like the rest of the population.



However, when looking at the underlying domain scores of the group, a unique profile emerges. It is clear that the engineer's strength is Mental Agility, scoring a 6 on average, which is considered significant when compared to the reference group. They thrive when analysing situations and when required to come up with unique solutions to particular problems. Their weakness however is Results Agility, which again would be considered a deviation from the reference group. According to Jan Meijning, a senior psychologist at HFMtalentindex, solving a puzzle is a good metaphor to explain this unique profile. It would seem that engineers really enjoy the process of solving the puzzle. They like to break down the problem into smaller components and coming up with the best and creative solution for solving it, with little to no context. They are not particularly interested in or motivated by knowing what the end result is of the puzzle. It is the process of solving the problem that they thrive on and learn from and the fact that something comes out of it seems to be a by-product.

The strongest & weakest Engineering Competencies

The strongest five competencies further enforces the picture that engineers enjoy analysing and breaking problems down. They have a high potential for analysing and forming opinions, strategic insights and situational awareness. What is also interesting is that they have a high potential for creativity and flexibility. This enforces the engineer's reliance on Mental Agility, showing that they have a strong ability to think outside the box and coming up with unique solutions to complex problems.

The weakest five competencies indicate that engineers are not overly social and mostly enjoy working on their own, as indicated with a low potential on social skills and cooperation. Their low potential on these competencies reflects their below average score on People Agility, since they don't put themselves into situations where they can learn from others, since they do not have the necessary competencies to do that.

Strongest Competencies		Weakest Competencies	
Competency	**Mean**	**Competency**	**Mean**
Creativity	6,2	Motivating	3,4
Analysing and Forming Opions	6,0	Team Building	3,3
Strategic Insights	5,6	Cooperation	3,2
Flexibility	5,4	Client Oriented	3,2
Situational Awareness	5,0	Social Skills	3,0

What motivates the engineer, and what does not?

Before delving into the results relating to the motivations, it is important to keep in mind what exactly the motivations are measuring. Motivations refer to what candidates think important to have in the work environment to keep them energized and motivated. The engineer's main motivations are freedom, analysing, and creativity. This means that engineers are looking for environments that offer them with the freedom to do their own thing, where they are given the opportunity to analyse problems and where they are allowed to express their creativity while problem solving. This is what provides the engineers the energy needed to be successful in their work.

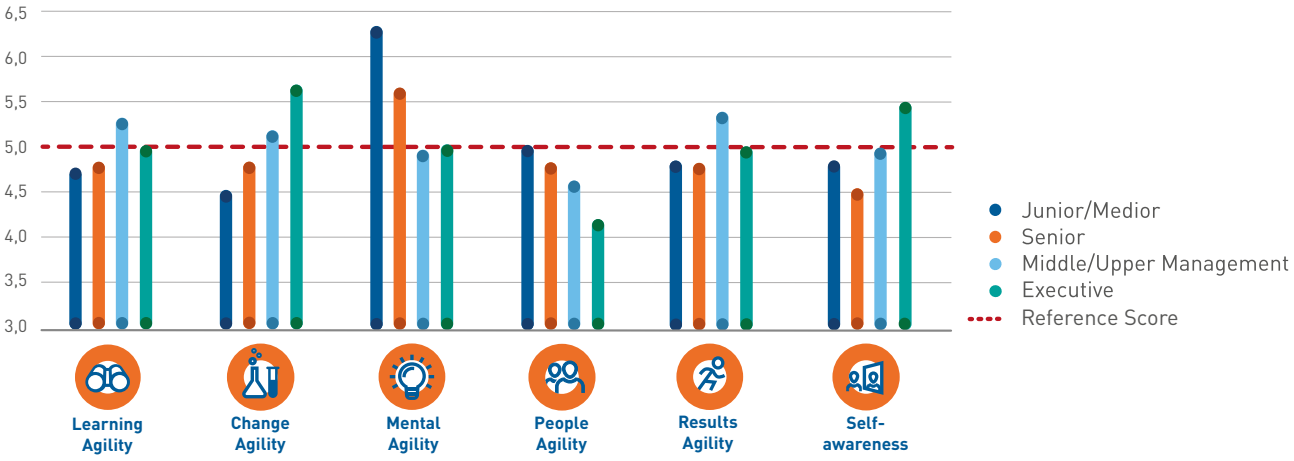
The motivations that they don't necessarily need in their work environment is helping, quality, and responsibility. What does this mean exactly? It means that engineers get less energy from doing these things. They do not want to constantly double check their work and they also don't want that responsibility. To put it into perspective, Jan Meijning indicated that these motivations are more likely to be found with accountants. Accountants like delving into the nitty-gritty of their work, making sure that things are up to standard and correct. It should be emphasized that the engineering group have the capacity to do the same, however at a greater cost to their energy levels than analysing and creativity would in daily life.

Main Motivations		Nonessential Motivations	
Motivations	**Mean**	**Motivations**	**Mean**
Freedom	6,5	Helping	4,2
Analysing	6,3	Quality	4,2
Creativity	6,0	Responsibility	4,0

Are Engineer Leaders more learning agile?

What makes a good leader? Previous research, conducted by HMFtalentindex, has indicated that individuals in leadership roles score high on Change Agility and Results Agility, while scoring lower on Mental and People Agility[3]. Another article, that focused on the most used competencies for senior management positions, found that the competencies that were deemed most important to evaluate and develop were Results-Orientedness, Cooperation, Persuasiveness, Commercial Drive, and Decisiveness to name a few[4] ; this was deemed to be the case by different clients evaluating a variety of senior management positions. This was the case for both selection and development of these candidates. Lastly, when looking at motivators, elements that candidates in senior management find important are status, responsibility, and success.

How well does the engineering group do compared to the 'ideal' leadership profile that has emerged from previous results? Based on the results, Jan Meijning concludes that the overall engineer group would have difficulty being task oriented project leaders. The data indicates that they predominantly utilise Mental Agility, while the other agilities just fall short of the average score. This shows that they enjoy analysing and thinking out–of-the-box and are more open to learning in situations that allow them to do these things. However, they are less inclined to learn by keeping focus on their goals (Results Agility) or exploring new environments (Change Agility) within engineering. This is no surprise, because engineers are more inclined towards analysing, creativity, and flexibility, but can get lost in trying to find the best solution and are at risk of losing track of their ultimate goal.
However, the question arises if this is the case for the entire engineer leadership population, or if there are different profiles present when looking at the different function levels? From the total group, 400 participants provided information about their function level:



The graph shows that there are indeed different profiles when splitting the data by function level. Those who are in middle management to executive level score high on Change Agility and Results Agility in comparison with the lower functions. Those in higher positions are willing to take initiative and try new things (Change Agility), while also focusing more on the results and which solutions work best (Results Agility). An interesting finding is that engineers with less work experience are more open to other people's opinions and alternative approaches to problems. This illustrates that these less experienced engineers are still modest about their abilities and therefore more inclined to seek advice. However, as the engineers move up the corporate ladder, they become less modest about their abilities and are therefore less inclined to ask others for advice or their opinions (i.e. low People Agility).

[3] For more information, refer to The Potential of Learning Agility – Research Paper
[4] For more information, refer to Which competencies do organisations use the most for selection and development

Leadership competencies and motivations

The above findings are further emphasized at competency and motivational levels. For instance, compared to the lower job levels, middle management and higher management levels score high on competencies such as Decisiveness, Commercial Drive, Innovation, Vitality, and Negotiating. At motivational level, they score higher on the need for Success, Status, Vitality, and Responsibility. These results, regarding Learning Agility, the competencies, and motivations all correspond with previous research that HFMtalentindex has conducted on candidates in leadership roles.

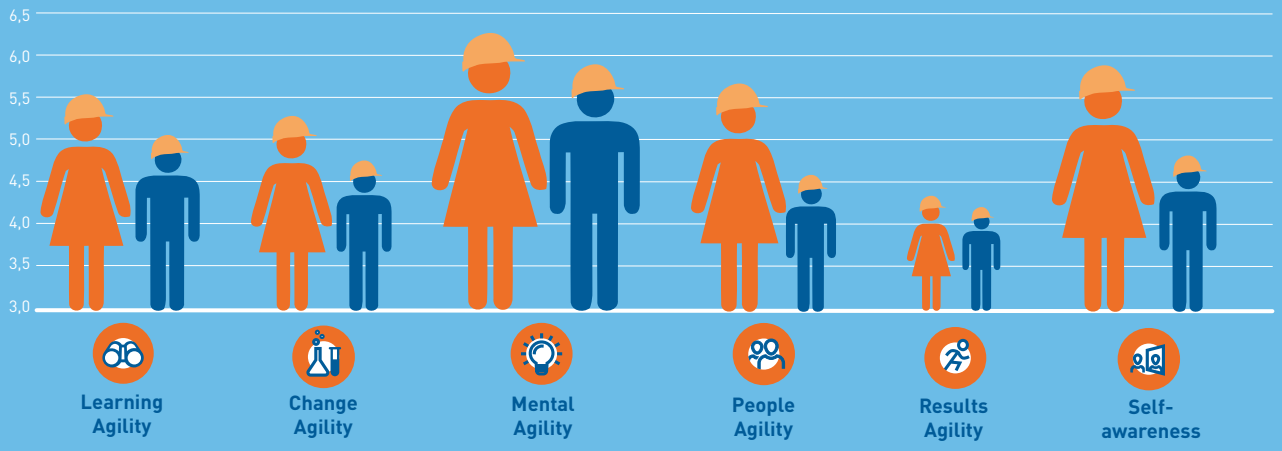
Therefore, those who end up in upper management have the skills needed for the leadership role. Jan Meijning states that this is not surprising, since those who end up in those positions are selected for their leadership qualities.

Competencies	Junior/Medior	Senior	Middle/Upper Management	Executive
Vitality	3,4	4,4	5,2	5,1
Innovation	3,9	4,1	4,7	5,0
Negotiation	3,4	4,1	5,1	5,0
Decisiveness	5,4	3,9	4,8	5,0
Commercial Drive	5,0	3,7	4,5	5,0

Motivations	Junior/Medior	Senior	Middle/Upper Management	Executive
Status	4,6	4,8	6,4	6,1
Vitality	4,2	4,8	5,4	5,9
Responsibility	3,0	3,5	5,2	5,6
Success	4,5	4,6	5,8	5,4

Women score higher than men

Another factor that was investigated was the gender difference within the engineering group. In the general population, it is observed that males score higher on Mental- and Results Agility and to a lesser extent Change- and Overall Learning Agility. Whereas, women's strength are in People Agility and, to a lesser extent, Self-awareness. Would this relationship also be observed amongst the engineers?



The first deviation to previous results is that female engineers are more Learning Agile than their male counterparts, which is not what is normally observed in the general population. The high score on Learning Agility is mainly due to the female engineer's high scores on People Agility and Self-awareness. In the general population, females also score high on People Agility and Self-awareness, but the difference is less pronounced than what is overserved with the female engineers. This is an ideal combination, since previous research found that those who have this profile have the greatest developmental change over time. Within a year, people with this profile show a greater improvement in their current function than those who don't. On top of that, women also score slightly higher on Change and Mental Agility, which also deviates from what is normally observed.

Female vs. Male – Competencies and motivations

The differences between female and male engineers on competency and motivation level were also investigated. At competency level, the two groups shared similar competencies for both the strongest and weakest competencies[5]. What is interesting to note is that the female engineers score higher than their male counterparts on almost all the competencies, meaning they have more potential than the male engineers. For instance, when looking at creativity, the female group score a 6.7, whereas the male group score a 6.1, which is a difference that is considered to be significant.

The results seen for the competencies were also found with the motivations (see figure A), with the main motivations and non-essential motivations similar for both groups. However, there is one difference that is worth mentioning. Instead of creativity, the female candidates indicated that they needed support from others. This means that for them to thrive, they need freedom and the opportunity to analyse things, on top of which they also want to be in a place where they have the opportunity to be surrounded by others and the ability to ask others for help.

[5] Look at the strongest and weakest competencies in the results section for the total group to get an idea of which competencies these are.

Figure A

Are Females the unique engineers for the future?

What characteristics makes the women amongst engineers so unique? In a study conducted by Kamphorst, Hofman, Jansen, & Terlouw, (2015), they focused on Dutch engineering students in The Netherlands. The investigation looked into what factors contributed to academic success in engineering degrees and whether there were any differences between men and women.

Independent study - differences between male and female engineers

In this study the main reason discovered for the differences between men and women in academic success was that women spent more time on independent study than the men in the program. Independent study refers to the amount of time an individual spends on studying. This can be related to Self-awareness, whereby women are more likely to spend time on developing their knowledge and skills than their male counterparts.

Social and academic integration female vs. male

Another factor that Kamphorst et al. (2015) found to be influential on academic success was the interaction between social integration and academic integration. Social integration relates to the amount of time a student spends with other students, whereas academic integration refers to the amount of time the student spends with teachers. Women spent more time on social integration, which had a positive effect on academic integration and thus more academic success, which was found to a lesser extent with men. This behaviour can be linked to People Agility, whereby women are more likely to spend more time with and are more open to input from others. This allows them to garner new and unique insights from fellow students and professors alike.

Male & female personality traits and engineering success

Research has also investigated personality traits that effect the success of engineering students, looking at differences between male and female engineers. In one study, both Agreeableness (People Orientedness) and Emotional Stability (reverse of Sensitivity) were found to predict academic success, irrespective of gender (Burton & Dowling, 2010). This is further corroborated by McKenzie, Gow, and, Schweitzer (2004), who observed that academic success is linked to Introversion (reverse of Extraversion) and Agreeableness. Lastly, in a study conducted by Felder, Forrest, Baker-Ward, Dietz and Mohr (1994), they found the Interest domain to be linked to successful completion of engineering courses. With these findings in mind, the female engineers within the HFMtalentindex cohort scored higher on Sensitivity, People Orientedness and Interest. Not only that, both the female and male engineers scored similarly low on Extraversion. The female group not only has the advantage of a higher Learning Agility and its domains, moreover they also have a successful personality profile to succeed in engineering, with the exception of scoring high on Sensitivity.

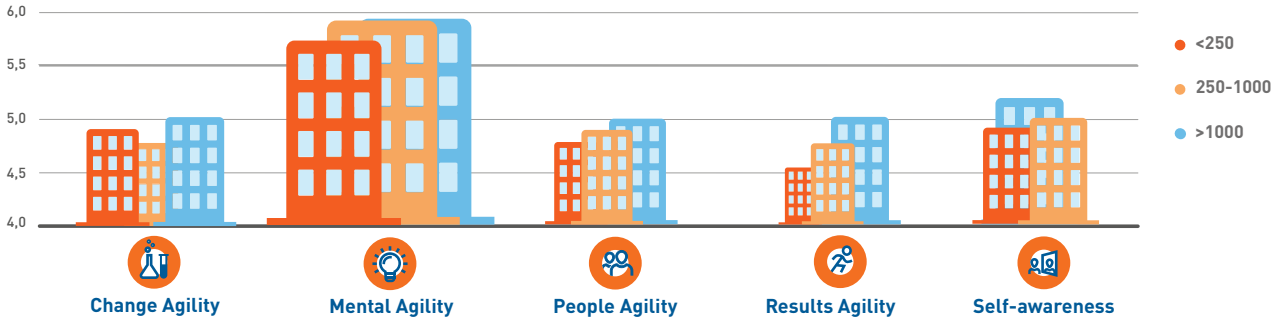
Women Engineers more adaptive

Given these results, Jan Meijning strongly believes that female engineers have the potential to create a more successful career for themselves, faster than their male counterparts. Due to their profile, female engineers can be employed in a wide range of functions within their profession, since they have the ability to quickly adapt to new situations and thrive, which is the bottom line of Learning Agility. He also states that due to the male dominant environment of engineering, women need to be better in all aspects compared to their male counterpart to achieve the same career opportunities.

Other results

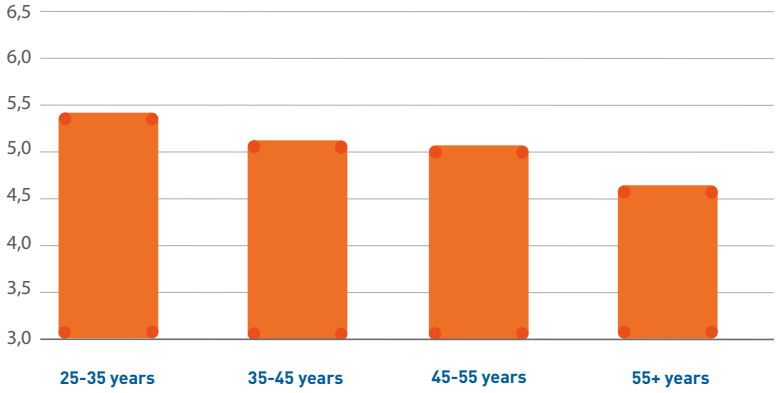
In this section, miscellaneous results that were also investigated are included here. Engineers that participated in the research not only filled in the questionnaire relating to Learning Agility, but also had to fill in demographic information about themselves. As with previous research, how Learning Agility interacts with these demographic questions were investigated.

Learning Agility & Organisation Size



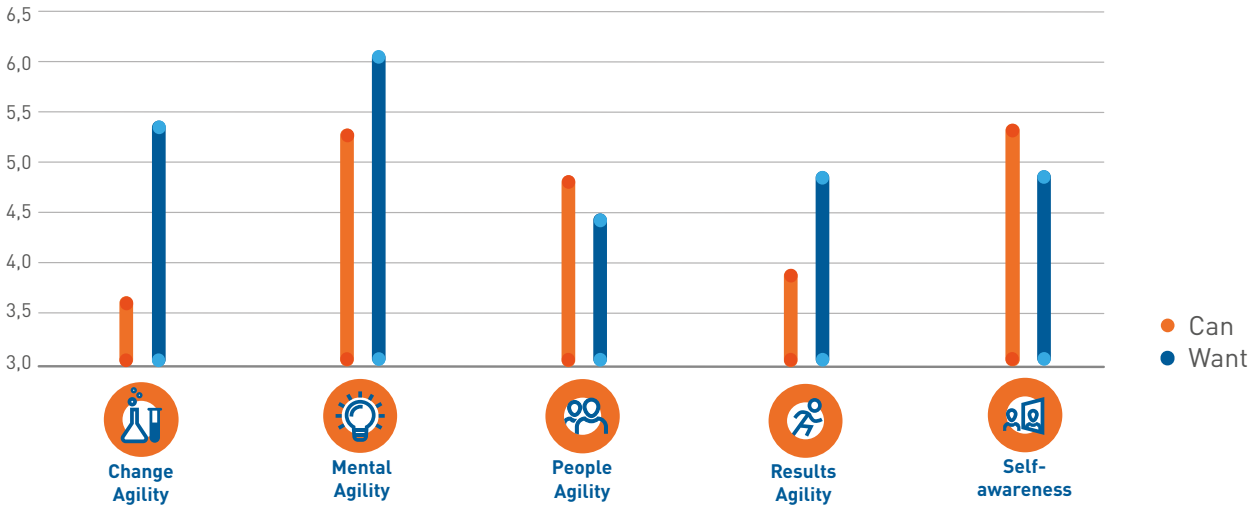
In previous research, that focused on the HR community, the smaller organisations (<20 to 249 people) and the larger organisations (1000+ people) would score highest on Learning Agility and it's domains, with the medium organisations (250 to 1000 people) scoring slightly lower. The engineering community has a different profile to that observed with the HR community. The engineering community shows a more linear relationship, with bigger companies having higher Learning Agility scores than smaller companies.

Learning Agility & Age



Previous research that looked into the general population, found that there was a negative linear relationship between Learning Agility and age of the candidate; this also includes the domains, with the exception of People Agility. This means that the younger candidates (25 to 35 years of age) score higher on Learning Agility than the older candidates (55+ years of age). As already mentioned, People Agility is the exception, with older candidates scoring higher than the younger candidates. Looking at the overall Learning Agility and its domains, the same relationship is also observed with the engineering group. The younger engineers score higher than their older colleagues. This also included People Agility, which deviates the engineers from previous results.

Learning Agility & Can/Want

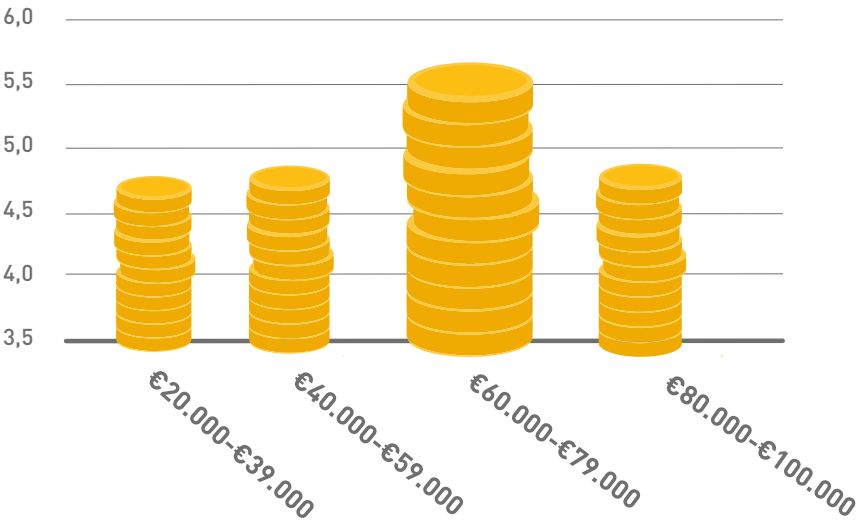


The Learning Agility domains can be split up into two categories: "can" and "want". "Can" refers to the groups potential for the agility, whereas "want" refers to what agility the group wants or likes to use. What is interesting to note, is that in the case of Change, Mental, and Results Agility, they really want to utilise those agilities, but do not have the potential to take full advantage of the agility. However, with People Agility and Self-awareness, the opposite can be said, they have the potential but do not really want to utilise them in daily life.

Higher Learning Agility, better paid engineer?

Previous results that look at the HR community, a linear relationship was found between salary and Learning Agility. What was found was that those who earned more, were also more Learning agile. This was also found with the other domains of Learning Agility, though it should be noted that with People Agility, the relationship was milder than the other domains.

It is interesting to note, is that with the engineering cohort, the most Learning agile group is the group that earns between 80 to 100 thousand euros. This is mainly due to their Results Agility and Self-awareness, thus it is a group that is aware of their strengths and weaknesses and are able to keep their goal in mind. This is also logical because the gain in career depends largely on being able to get results in a difficult environment and complex projects.



Conclusion

The collaboration with the Royal Dutch Institute of Engineering have garnered some interesting insights into what makes an engineer tick and whether or not they are ready for the future. The analysis was conducted among 542 engineers, with a demographic breakdown that reflects the engineering population, meaning that the results provide an accurate picture of the engineering population.

A unique engineering Learning Agility-profile

When looking at the overall engineering group, their strength lays in Mental Agility, with a weakness in Results Agility. This profile indicates that engineers are more interested in analysing things, taking problems apart and putting them back together, and coming up with unique solutions to problems that are abstract. They are not particularly interested in the end result of what they are working on, it is the process itself that the engineers enjoy. This is corroborated by the type of competencies that the engineers show a high potential for, and also by what they need from their work environment and what motivates them. Engineers have a high potential regarding competencies such as creativity, analysing and forming opinions, and strategic insights. They also get energized by analysing things, being creative and getting the necessary freedom to do all of this.

The engineer as project leader?

Based on this profile, Jan Meijning, a senior psychologist at HFMtalentindex, states that the typical engineer will not necessarily make a good project leader. This assessment was based on previous research that was conducted by HFMtalentindex, which found those in leadership positions to be scoring high on Change and Results Agility, with a lower score on Mental and People Agility. Research also found that competencies that are deemed important for leadership are Results-Orientedness, Cooperation, Persuasiveness, Commercial Drive, and Decisiveness to name a few, which are not found in the overall group of engineers. The same can be said about the motivations, since those in leadership positions are seeking status, responsibility, and success. However, when the engineering cohort was split into groups based on function level, different profiles emerged. It became apparent that those who stated they were in upper management shared the same profile seen in previous research. For example, they had a high potential on competencies like Decisiveness, Negotiation, and Commercial Drive, with a need for Status and Success. Jan Meijning stated that this is not surprising, because those who end up in that position were chosen for their leadership qualities.

Male versus Female

Another interesting avenue that was delved into were the gender differences within the engineering group. What was interesting about this analysis was that it deviated from what was seen in previous research. Generally speaking, men usually score higher on Mental and Results Agility, and to a lesser extent on Change and Overall Learning Agility, while women score higher on People Agility and Self-awareness. What is observed within the engineering group is that women score higher on Overall Learning agility. This is due to their high scores on People Agility and Self-awareness, which is not unusual, however they also score slightly higher on Change and Mental Agility.

Due to their high score on People Agility and Self-awareness, women are the ideal candidate to hire, since previous research has indicated that those who score high on these two domains develop faster within a year than those who score low in these two domains. This is also corroborated by other research that looked into what factors contributed to female engineers succeeding at university, which indicated that factors relating to People Agility and Self-awareness to be success factors to thriving in the engineering field. Not only that, the female engineers also score higher than their male counterparts on the other agilities and more importantly Overall Learning Agility. Other factors, such as personality were also found to contribute to success in the field of engineering. The personality profile that emerged from literature was very similar to what was observed in the female group within the engineering cohort.

Are women engineers the future?

Jan Meijning believes that female candidates in the engineering field are the future. They are more agile, they encompass the personality profile for success in the field, and they have the ideal agilities that will allow them to develop more efficiently over time (i.e. People Agility and Self-awareness). Moreover, the field of engineering is shifting towards a more interpersonal field, with engineers needing to interact more with clients and colleagues on a one-to-one basis. There is however a caveat, for women to thrive and to fully utilise these agilities, they must be in teams that contain other women. This is for two reasons, the first being that men score low on People Agility, meaning they are not as willing to work together with others as readily. The second reason is that female engineers indicated a need for support from others, meaning that they like to be surrounded by others and given the ability to ask others for help, which men also share to a lesser degree. Thus, when a woman is in a team containing only men, the opportunities to interact together, to share ideas, and to learn from each other is quite limited. Thus, they end up floundering rather than succeeding.

How is Learning Agility constructed?

Learning Agility is measured in four domains and one transcending factor: Selfawareness, which influences the scores on all facets.

Change Agility

People with a high score on Change Agility are characterised by a constant curiosity, that is fuelled by new unknown things. They like to experiment, try things, and have a passion for new experiences. As a result, they experience more. They are able to learn more from their experiences, because they are intrinsically motivated to investigate matters and enjoy when things are not yet known to them.

Mental Agility

People with a high score on Mental Agility enjoy using new ideas to create new insights when things are complex or unclear. They like to analyse and are often able to get to the bottom of things in new ways, by thinking outside the box. They have an open perspective and are challenged by new ideas. This helps them recognise patterns in new experiences more quickly than others. They quickly understand how the situation works and what they can learn from their experience.

People Agility

People with a high score on People Agility are constructive to others and are open to people with different backgrounds and opinions. They have a need to properly understand what others mean and take others' opinions seriously. This makes it easier for them to get in touch with others and they succeed better in learning from the input of others. In addition, they can adapt more easily, for example to people from other cultures. As a result, other people share more with them.

Results Agility

People with a high score on Results Agility have a strong desire to be successful and always look for the best way to achieve results. They are often ambitious, self confident and remain calm under pressure. Because they are better able to set goals in new and unfamiliar situations, they maintain focus and learn quickly what is or isn't important in order to make new things successful.

Self-awareness

People with a high score on Self-awareness know their own strengths and weaknesses. They are often critical of their own performance and their actions. As a result, they are more keen on how they can do things better and their overall willingness to learn is higher. Therefore, Self-awareness has a special role in Learning Agility: a high score increases the possibilities on the other Learning Agility elements, while a low score limits them.

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Koen Hofkes
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Koen Hofkes is an organisational psychologist and co-founder of HFMtalentindex. He collaborates with international organisations in developing their leadership models. In recent years he has specialised in the design and implementation of innovative online methods to identify and grow people qualities and talents within organisations.