



# **The Pathway Model**

## **Academic Reference Paper**

Integrating decision-making styles, subject preferences, hobbies, interests, and passions to help students predict their ideal third level education and career options.

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## Abstract

Decision-making is a fascinating subject and one that very few people today truly appreciate, particularly its significance, influence, and impact on someone's future - for the person making the decision and for those the decision may impact. Decision-making for students, especially when it comes to career choices, is equally important as it is for adults in both life choices and everyday business decisions. Like risk management in business, the ability to influence a positive outcome is best delivered through early intervention. The world is unfortunately littered with people who have made poor career choices, costing governments, parents and students valuable lost time and cost. As students look to set themselves up for success in life when they make assessments about third level education options, focusing this choice on a course and career that best aligns with their decision-making style, favourite subjects, and things they value in life will cast an enjoyable and fruitful roadmap, maximising the return on their precious investment in time, providing clarity and focus on what they choose to do in third level, as well as enjoying what they do in their career.

This paper sets out the background to the decision-making process that individuals follow, how this impinges on their daily lives, and how values and different cultures, reflected through biases, means that each person experiences decision-making differently. It also explains the daily quantum of thoughts, decisions, and higher consequence decisions, in perspective for adults and adolescents, presented to allow the reader to appreciate and understand the benefits of striving for balance in decision-making to support smart, informed choices in students' career decisions. Using validated decision-making theory, founded in innate values and learned behaviours, together with students' subject preferences, hobbies, interests, and passions, the most suitable third level education and career options can be predicted with confidence though the validated Pathway careers' model.

This model and research have been developed and completed by Ingenium Training & Consulting Ltd, the parent company of Pathway. Overall, the results from this research on the application of Pathway, demonstrate a significantly positive impact on participating students where almost all felt that their decision-making style was very accurately reflected, with each report providing insightful feedback on strengths and opportunities for improvement and self-reflection; that their Pathway recommended courses suited their decision-making style and favourite subjects, as well as the application of their hobbies, interests, and passions; almost all (96.6%) had never experienced a tool like this before and participation significantly increased their awareness of courses that they would now definitely consider; that the survey process was easy to navigate, as well as thought-provoking; and overall, almost all participants (99.3%) found Pathway extremely useful and something that they would recommend to their friends and siblings.

Following completion of this research project, the Pathway survey and report have been automated using an online portal and software tool, developed from the validated algorithm. Pathway is not just a report, it is also complemented with an online, self-paced 12-module Personal Development Plan (PDP) for students, covering modules in decision-making, presentation & communication skills, unconscious bias, diversity & inclusion, problem solving, impact of distractions, emotional intelligence, influencing & difficult conversations, learning styles, time management, financial skills, and entrepreneurship. These modules were selected for the Pathway Personal Development Program based on the assessment of outcomes from discussions with students that participated in the Pathway research phases, consolidated into 12 themes of interest, education, and skills development.

## 1.0 Introduction

The subject of career choices is a critical decision for adolescents, accentuated by the impact a career has on a person's future income, living-standard, societal standing, social network, emotional well-being, and self-worth. A career choice is one that will affect an individual for the rest of their lives. Research has shown that many students make career choices without sufficient knowledge and information. Instead, choices are made by unsubstantiated and often biased perceptions of some ideal job, unless supported by the rationale of a career guidance counsellor. Adolescence, an intermediary period interposing childhood and adulthood, is a time when students have the opportunity to develop new skills to help set them up for success in adult life, where new roles and responsibilities await them (Harris et al., 2002).

Our research in developing the Pathway model has been designed to provide students with an enhanced awareness and guidance to make considered career choices. On examination, decision-making can be seen as an intricate science, reflecting the significance and magnitude of a decision that appears to be influenced by multiple factors and variables, both extrinsic and intrinsic. However, the most appropriate and aligned career choice is critically imperative to warrant adolescent progression to ensure they live and enjoy their lives, developing and sustaining their personal motivation throughout their future career. To make the correct career choice, it is critical that adolescents are appraised of the multitude of variables that connect with this decision, particularly those linked with their predilections, decision-making style, and passions. Nyamwange (2016) found that first year university students significantly value prior knowledge about a career, when looking at the subject retrospectively. They also embrace mentorship and socialising with people in the career of interest.

Made consciously or unconsciously, decisions shape our lives, delivering either positive, neutral, or negative consequences. The process of decision-making, however, can be considered as a tool, administered by a complex series of brain functions, deployed when we are faced with prevailing opportunities, challenges, and uncertainties in life (Hammond, 2010). It is also contended that decision-making is part science and part art, according to Kreitner and Kinicki (2012), and given the increased quantum of distractions in students' daily lives through the proliferation of social media, designed to attract and harvest students' attention, making good decisions is not easy in today's world, hence the science aspect becomes more and more important. Students are not only being asked to make faster decisions, but they also must process an overwhelming amount of information during the decision-making process.

Each of us possesses our own unique decision-making style, founded in our innate values, influenced by what we see and learn, and reflected through the combination of how an individual perceives and comprehends stimuli and the general manner in which he or she chooses to respond to such information (Rowe and Mason, 1987). Accordingly, our personal characteristics critically influence how individuals make decisions. Importantly, our decision-making style affects our approach to decision-making and developing awareness around our preferred decision-making style can help individuals make better decisions (Rowe and Mason, 1987). This is especially true for students, given the greater volume of distractions they face.

For students, understanding their unique decision-making style is important to align their internal compass between their cognitive functioning and the characteristics of their external stimuli. This understanding provides:

- enhanced self-awareness;
- a greater recognition of the advantages and limitations of their unique style;
- an ability to judge the functionality of their style;
- adopt countermeasures to the limitations of their style.

For adults, in life and in business, any change management initiative starts with developing and understanding a cognisance around the need for change. This same cognisance applies for students, where a decision-making style assessment, most likely, provides them with their first psychometric mirror reflection. Being aware of your own unique decision-making style helps you to address and embrace future training to learn how to make better decisions (Rayner and Cools, 2010). For students assessing their decision-making style, their foundational cognitive profile becomes clear, upon which their subject preferences, hobbies, interests, and passions, can be processed to define the most suitable third level education and career options. The Pathway careers' model has been designed and validated to assimilate these characteristics to predict each student's career profile and options.

The Pathway careers' model has been developed using a four-part survey process, with each step accruing a series of Pathway points assigned to each of the selected 84 possible third level course cluster options, defined as the dependent variable, assimilated from worldwide universities and third level institutions. A cluster is defined as a common title for similar sounding courses, populated with Pathway points within the model calculated relative to students' responses. The four areas of the Pathway survey for students include:

- favourite subjects' assessment;
- decision making style combinations;
- hobbies interests and passions selected;
- streamed association preferences to align with students' characteristics.

Following the completion of the survey, based on the points accrued across each of the four steps, a hierarchy of the 84 possible third level courses across six different faculties is created, unique to each student's response. This includes a final series of qualifying criteria for each of the 84 third level course clusters, where certain decision-making style combinations, favourite subject selections, as well as certain hobbies, interests and passions present are assessed to qualify courses to be consolidated into the final assessment. These are termed as association rules. The final Pathway report summarises the top 12 third level course options for each student from the remaining short-listed courses, filtered from the original list of 84, and presented to students in a hierarchy in descending order of the most Pathway points accumulated.

Research carried out with 412 students from 12 different schools and regions in Ireland over a four-year period, between the March 2017 and March 2021, allowed the researchers to validate the integrated four-part survey tool, anchored to the academically validated decision-making styles foundational theory and assimilated to consolidate the Pathway model. This research was carried out in two phases: (1) a pilot phase research to determine a range of empirical multipliers to be incorporated into the Pathway model - from March 2017 to August 2018, testing 144 independent variables linked with subjects, decision-making styles, hobbies, interests, and passions, correlated against 84 as dependent variables of third level university degrees; and (2) a testing phase of the Pathway model - from September 2018 to March 2021. A significant part of this research was assembling conventional decision-making theory, whilst at the same time understanding how this should be positioned from a student's perspective, hence the Pathway tagline 'Created with students, for students.'

This objective of this paper is to outline the confluence of complementary and diverse literature on adolescent development and decision making, consolidated to support the selected research processes and methods used in the development and validation of the Pathway model for third level career choices.

## 2.0 Literature Review

### **Student Educational Investment - National Government's Perspective**

In a report published by the Irish Government's Department of Public Expenditure and Reform (Government of Ireland, 2019), it assessed the investment in student education and skills as the third largest area of government spending with €10.77 billion allocated in 2019 for 2020. This allocation covered spending on primary level (typically between the ages 5 to 12), secondary level (typically between the ages 12 to 18), and third level education (typically between the ages 18 to 23), as well as in the area of skills development, with 79% of this expenditure designated for the third-level education. This is considered with the backdrop of a 15% third-level student drop-out rate from university or college (Irish Times, 2017) where new entrants to third level did not move on to their second year of their course. With 44,000 new students having entered third level courses in 2019, it is anticipated that 6,600 of these will have dropped out by 2020. To assess the monetary impact of this: 79% of €10.77 billion is invested in third level education, which is €8.5 billion, split across four years, with the first year, from the researchers estimates, accounting for c.30%, suggesting up to c.€2.55 billion could be spent on first year university educational investment. In the estimation of the researchers, applying this pro-rata estimate for third level year one students of €2.55 billion against a drop our rate of 15%, the government could be losing up to c. €382.5 million of student investment every year. This does not include the cost of lost opportunity in the students' own time and their personal investments made. Pathway is designed to significantly mitigate against these losses by providing students with an online automated tool, which they can use when approaching the final years in secondary education cycle, and as they begin to think about third level, to help them choose their ideal third level course, one that matches their decision-making style, favourite subjects, hobbies interests, passions, and consequently reduce the drop-out rate from third level courses.

### **The Evolution of Decision Making**

The process of decision-making can depend on many factors, according to Rowe and Boulgarides (1994), including 'the context in which a decision is made, the decision maker's way of perceiving and understanding cues, and what the decision maker values or judges as important'. Luce (2001) suggests that every decision involves trade-offs, where decision-making is a process of accepting less of something, to get more of something else. As the science of psychoanalysis developed throughout the twentieth century so too did decision-making science, with an early focus of researchers on management and leadership styles of decision-making (Taylor, 1947, Tanenbaum and Schmidt, 1958, Adorno et al., 1950 and Rokeach, 1960). As research progressed to examine decision-making and types of decisions (Simon, 1960, Harvey et al., 1961 and Schroder et al., 1967) they built upon earlier, established research, including Jung's psychological types, human information processing and problem solving. Jung's psychological types (1921) provided the inspiration for advances in understanding decision-making, forming the basis for the Myers-Briggs assessment introduced in 1943, and further developed by Kilman and Mitroff (1976), who applied a filtered version of Myers-Briggs to decision-making styles. Fascination with decision-making grew in the second half of the last century, with many of the concepts and models utilised in organisations and academia evolving during this time. To analyse the research in the field and seek to understand its future direction, Rowe and Boulgarides (1983) adopted a taxonomy approach, categorising decision style models (Figure 1.0).

The researchers' taxonomy categorised the different models based on decision certainty relative to the decision-making process. Rowe and Boulgarides (1994) further refined their thinking considering advances in cognitive psychology, which focused on perception, information processing, problem solving, memory, creativity, integration of cues, dogmatic fixations, and operant response, and how behaviour is impacted by consequences. The study of left and right hemispheres of the brain was an important area of study (Mann, 1982, Lundberg and Bigelow, 1982,

Springer and Deutsch, 1981), leading to the realisation of the importance of cognitive complexity in examining decision-making styles.

The Decision-Making Style Inventory, subsequently developed and propagated by Rowe and Boulgarides (1994), is an internationally validated and reliable twenty-item Likert assessment questionnaire that identifies an individual's decision-making style preferences across four distinct decision-making style combination, including Directive, Analytical, Conceptual and Behavioural. As an integrated 'values and learned behaviours' model, it calls upon an individual's life journey, embracing values, upbringing, experiences, education, and role application.



Figure 1.0: Categorisation of decision-style models (adapted from Rowe and Boulgarides, 1983)

### Decision-Making Style Inventory: Reliability and Validity

In their pilot research project, Rowe and Boulgarides (1994) distributed the decision-making style inventory to over 10,000 managers and professionals to determine the average score. This initial research included company presidents; board chairs; corporate planners; architects; police officers and chiefs; military personnel; teachers and nurses. Each styles score was found to have a near-normal distribution. An individual score in the upper quartile (more than seven points above the mean) reflects the dominance in the respective decision style. A score less than seven points below the mean represented a least-preferred style. It is estimated that over 200,000 individuals have completed the Decision-Making Style Inventory over the last twenty years across a range of business and industry sectors and student development areas; heavy manufacturing; pharmaceuticals; aerospace; education; consulting; electronics; energy; health care; telecommunications; and transportation; as well as in secondary & tertiary education form this Pathway research project. The Decision-Making Style Inventory reliability and validity have been confirmed based upon the criteria of Robey and Taggart (1991) under inferring processing style from self-description inventories. Also, from Rowe and Boulgarides (1994) results, there is an extremely high validity and reliability rate. Respondents almost invariably agreed with their decision styles as shown on the test instrument. Rowe and Cox (1996) have estimated the validity of this instrument at ninety percent.

Rowe and Mason (1997) emphasise that a number of statistical tests were used to determine the validity and reliability of the decision-making style inventory, including split-half reliability testing using nine groups from different organisations; test-retest reliability using different groups; correlation with other test instruments and face validity based on personal interviews and observations in longitudinal studies. They report the results have proven highly significant with strong positive correlation found with other established test instruments such as the Myers-Briggs Type Indicator and the Kolb Learning Style Inventory. Ninety present of individuals who took the

Decision-Making Style Inventory agreed with its findings, and 70% with the test-retest reliability. These statistical measures indicate that the Decision-Making Style Inventory is a valid test instrument. The Decision-Making Style Inventory model has also been widely used in different countries and cultures (Podrug, 2011, Kasprzhak et al., 2015, and Truong et al., 2017). It has also been tested in exploring the impact of gender on decision-making (Boulgarides, 1984, Daewoo, 1996).

In addition to above, the model has been utilised extensively by the Pathway developers, Ingenium Training & Consulting, with in excess of 57,000 people taking the survey across 22 different nationalities for Ingenium's consulting assignments as well as in partnership with ExxonMobil corporation (Santamaria et al., 2018). As part of this research, the Pathway decision-making inventory model survey has been tested on 412 students, ranging in age from 16 to 21, the results of which are discussed later in this paper.

A decision-making style preference reflects the combination of how an individual perceives and comprehends stimuli and the general manner in which he or she chooses to respond to such information. The Decision-Making Style Inventory from Rowe and Boulgarides (1994) has been adapted for Pathway as part of the online portal questionnaire which generates a personalised profile as part of the overall Pathway report, portrayed Figure 2.0, to test for decision-making styles preferences and predilections.

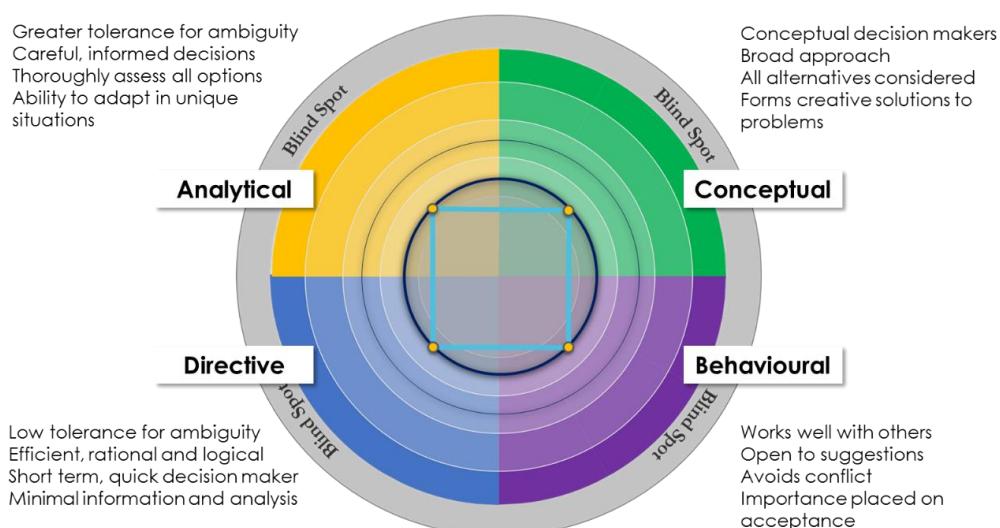


Figure 2.0: Pathway Decision-Making Style Quadrants

The adapted Pathway decision making model, with the questions modified slightly in terms of language and reference to suit teenagers, without changing the validity of the tool, assesses styles along two different dimensions, namely: Value Orientation as reflected on the horizontal axis, which reflects the extent to which an individual focuses their attention on either task and technical concerns (left hand side of the model), relative to people and social concerns (right hand side), when making decisions. The second assessment on the vertical classified as Tolerance for Ambiguity, which reflects the extent to which an individual has a high need for structure or control in his or her life.

When these dimensions of value orientation and tolerance for ambiguity are combined, they frame four distinct styles of decision-making: Directive, Analytical, Conceptual and Behavioural, all of which represent different areas of how individuals think, make decisions, and relate to others in life. The Directive style is where individuals have low tolerance for ambiguity and are orientated toward task and technical concerns when making decisions. They are efficient, logical, practical, and decisive and like to focus on facts. However, in their pursuit of speed and results, these individuals can at

times be somewhat autocratic, exercise power and control, and focus on the short-term. The Analytical style has a much higher tolerance for ambiguity, assuming the individual has a process in which to analyse, and characterised by the tendency to, at times, over analyse a situation. Individuals with this style like to consider more information and alternatives when compared with the Directive style. Analytic individuals are careful decision makers, who take longer to make decisions, but who also respond well to new or uncertain situations. Barber (2005) found that adolescents who are educated in thinking in an analytical way will, more likely, assess and avoid risk type behaviours, after they were introduced to the consequences of the risks.

Conceptual decision-makers are individuals that have a high tolerance for ambiguity, with or without a process, and tend to focus on the people or social aspects of a work situation. They take a broad perspective to problem solving and like to consider many options and future possibilities; they rely on intuition and discussion with others to acquire information. Downsides to this style are that it can foster an idealistic and indecisive approach to decision-making. Finally, the Behavioural style, which is the most people orientated of the four styles. Individuals with this style work well with others and enjoy social interactions in which opinions are openly exchanged. Behavioural types are supportive, receptive to suggestions, show warmth, and prefer verbal to written information. This style, which looks to avoid conflict, can sometimes be seen as a wishy-washy approach to decision-making where individuals have a hard time saying no to others in avoiding conflict.

### **Evolution of Adolescent Decision-Making Styles**

Piaget (1972, 2006), who has led research in adolescent cognitive development as teenagers transition to adults, suggests four phases in growth: those being the sensorimotor, preoperational, concrete operations and formal operations phases. This has been further validated by Shaffer and Kipp (2014). The fourth phase of 'formal operations' is only developed during adolescence, and linked with abstract thinking, logical reasoning and problem-solving skills. The accumulation of cognitive advancement during this phase in adolescents involves the creation of scenario identification, idea generation, alternatives, and options consolidation, considered key for agile and responsive decision making, termed as adaptive decision making by Steinberg (2007). The fourth phase in cognitive development during adolescence differs from early childhood cognitive development, where logical reasoning of ideas is absent. Piaget (1972, 2006) concludes that decision making is an evolutionary process that advances significantly during adolescence, given the numerous challenges that teenagers face as they grow and develop. Here, they begin to use their imagination in a more pragmatic way. The use of imagination is something developed in young children in play, whilst in older adolescents it is about applying that imagination to understand people, decision-making styles, and subjects (Cocchimiglio, 2021). As such, independent decision-making styles develop during the adolescent years, however, Ozutrk et al. (2011) believe that unique independent styles emerge prior to this, linked with a familial social context.

### **Decision-Making Significance - Daily Thoughts and Decisions**

In 2005, the National Science Foundation published an article regarding research about human thoughts per day; thoughts for which are potential precursors to choices. The survey concluded that the average person has as many as 12,000 to 50,000 thoughts per day, depending on how 'deep' a thinker one is. Other estimates run as high as 60,000 per day. The article also found that for those who meditate, this higher level of daily thoughts is unlikely to be a surprise. Meditators are familiar with the 'monkey mind' phenomenon in which the mind is observed as an out-of-control thought generator. The Laboratory of Neuro Imaging at the University of Southern California research concluded that the average human being could have 'up to' a total of 70,000 thoughts per day.

Based on these data resources, it is reasonable to deduce that for an average human being, something between 20,000 to 70,000 daily thoughts takes place. This range is used as a starting reference point for an individual's decision-making capacity and translating those thoughts into

choices, many different types of decisions provide reference and structure within an individual's daily life. When converting thoughts into conscious or unconscious choices, different types of choices emerge with many different types of decisions providing the structure within an individual's daily life. For adults, there are major life decisions, such as getting married, purchasing a house, having children. For students, these life decisions are deciding to study, friends to spend time with and selecting their third level college course. The average adult makes an estimated 2,000 to 3,000 decisions a day (Sollisch, 2016). This figure may seem high, however, researchers at Cornell University suggest that we make 227 decisions every day about food alone (Wansink and Sobal, 2007), and we make an astounding 140 decisions per minute while driving. Looking at decision-making in an occupational context, teachers make 1,500 educational decisions each day, averaging four decisions a minute. That does not include decisions that go into curriculum, grading, feedback, and revision of planned instruction.

### **Values and Cognitive Perception**

Martinsons et al. (2006) contend that two most significant influences on decision-making are values and cognitive perception. Both affect how an individual interprets and responds to particular stimuli and conditions. For example, urgent and comprehensive responses are more likely when situations are perceived as threats rather than opportunities, with values being integral to thoughts and actions. These constructs influence the evaluation of the problem: Is this serious? Is it solvable? as well as potential solutions: Is it worth trying? Was it successful? Other areas that influence decision-making is the process used to make choices, essentially the steps that someone follows include: the potential impact on relationships; the boundaries of and limits for perceived ethical behaviour; and the responses to external pressures (Rowe and Boulgarides, 1983, 1994).

Building further on the importance and impact of values and cognitive perception on decision-making; firstly, values, which are innate to each individual, are central to the decision-making process. Different people have different values, particularly so when different nationalities and value systems are considered. Hofstede (1980), who carried out a series of seminal studies on work-related values of IBM employees in over sixty countries, found huge variations in cultural values, in each case anchored to their respective histories. Secondly, cognitive perception is the reference point to translate the interpretation of information for different decisions, as the assessment of information inevitably involves judgement, influenced by personal bias.



Adapted from Robbins & Coulter (2011) Decision-making

Figure 3.0: Common Decision-making Errors and Biases

Biases create varying frames of reference and subjective interpretations of situations, which in turn determine our responses to specific situations (Morley et al., 2004). Individuals can potentially make a variety of systematic mistakes when making decisions. These mistakes are generally associated with a host of biases that occur when we use judgemental heuristics, represented as 'rules of thumb' or shortcuts that individuals use to reduce information-processing demands (Kreitner and Kinicki, 2012). A selection of these biases, which can create errors in judgement, are highlighted in figure 3.0.

As humans, we automatically use these biases without necessarily being consciously aware that they can influence our judgement. The use of heuristics helps decision makers to reduce the uncertainty inherent within the decision-making process, as well as easing emerging stress around a difficult decision. Because these shortcuts call upon knowledge gained from past experience, they can help decision makers evaluate current problems quite easily. Conversely, they can also lead to systematic errors that erode the quality of decisions.

The concept of explaining cognitive bias to teenagers at a secondary school level, and linking this with career decisions, has objectively and successfully been introduced by Hanna and Minton (2014), after they re-badged the term 'Cognitive Bias' into 'Hunting Assumptions', with the metaphor term connecting well with the group in the context of clarifying consciousness, enhancing perception, and consequently creating better judgement in the decision-making process.

### **Adolescent Development - Fast & Slow Thinking**

'Fast Thinking' and 'Slow Thinking' (Kahneman, 2011) are the terms used to describe the complex, mental processing going on in the human brain in a simple and effective way. Kahneman, a Nobel Prize winner for his research into human psychology, outlines that the human brain consists of two systems, often in conflict with each other. System 1 – Fast Thinking is where decisions are taken quickly, effortlessly, and intuitively, and System 2 – Slow Thinking is where there is deliberation and analysis which takes more time. He espouses the need for people to 'recognise situations in which mistakes are likely and try harder to avoid significant mistakes when stakes are high, while observing that 'because thinking slow takes work, we are prone to think fast, the path of least resistance. Again, this assessment helps in understanding bias.'

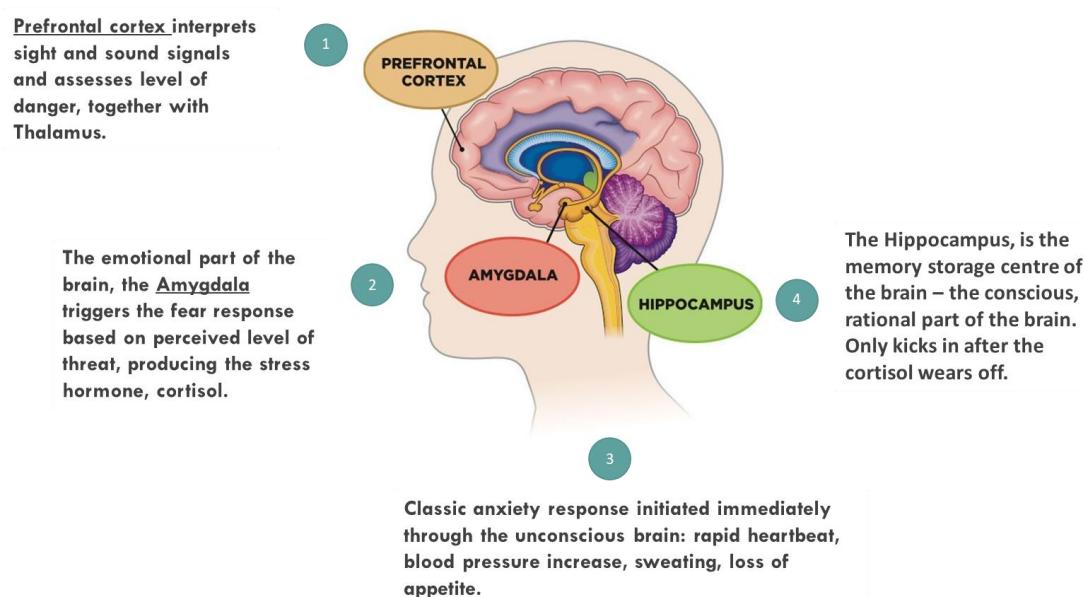


Figure 4.0: Impact of Stress & Pressure on Decision Making

Good judgement is not something teenagers generally excel at (Campellone and Kent Turley, 2021; Stanford Children's Health Publication, 2021), as the rational part of the teenager brain does not fully

develop until they reach the age of 23-25 years of age, and relative to adults, cognitive processing for teenagers is different. Generally, adult cognitive processing follows a more logical approach, where decision-making is driven through the prefrontal cortex. If we look at a stressful situation and consider how this might be processed by adults and by teenagers, we can see the differences emerge. Figure 4.0 helps explain this.

### Personal Risk in Decision-Making

When it comes to personal safety and decision-making, lack of attention to risk events is one of the main factors in incidents, and distraction is frequently used to refer to this lack of attention or to attending to something irrelevant. The result of distraction is an impaired capacity to process relevant information (Rumar, 1990) because of perceptual inefficiency and/or inadequate response selection. Attention is necessary for conscious perception (Mack and Rock, 1998), but engaging in events unrelated to the task at hand could also directly affect decision processes, producing incorrect or late response selection. As previously discussed, we make 140 decisions per minute while driving, if you make the right decision 99 percent of the time, the 1 percent you make the wrong decision you will make 84 mistakes per hour. That equates to 672 mistakes in an eight-hour day. These statistics highlight the importance of being aware of your environment and your decision-making style. For students, being conscious of their decision-making style and the potential inherent biases provides a solid foundation from which to make decisions relating to personal risk assessment. Decision-making styles and heuristics are essentially 'hard wired' into each of our approaches to decision-making with the associated issues that this creates. These are multiple biases, each capable of anchoring an individual's style into a quadrant of one of the four decision-making styles. This could be a good thing, or potentially harmful, depending on the context and situation. The relevance of understanding decision-making styles and biases is that it highlights the imperfections of human decision-making processes, which becomes particularly important when risk is a factor and there is a need to make good, safe choices. The phenomena such as the "psychological refractory period" (Pashler et al., 2001) indicate that a difficulty to perform two tasks simultaneously arises when both tasks require a central process of evaluation and response generation; that is, the attentional interference occurs at central processing levels.

The stage of exploring alternatives is often the most time-consuming part of the decision-making process. This stage sometimes takes so long that a decision is never made. To make this step efficient, be clear about the factors you want to include in your analysis. There are three key factors to consider:

- *Risk* - Most decisions involve some risk. However, you need to uncover and understand the risks to make the best choice possible.
- *Consequences* - You cannot predict the implications of a decision with 100% accuracy. But you can be careful and systematic in the way that you identify and evaluate possible consequences.
- *Feasibility* - Is the choice realistic and implementable? This factor is often ignored. You usually have to consider certain constraints when making a decision. As part of this evaluation stage, ensure that the alternative you have selected is significantly better than the status quo.

### Peer Influences on Adolescent Decision Making

Research by Albert et al. (2013), on the influence of social and emotional factors on adolescent decision making – specifically those behaviours that drive greater adolescent propensity for risk-taking – that evolve from a development gap between the brain's evolving socio-emotional reward system relative to a developing system of cognitive-control. Their research suggests that as adolescents spend a greater amount of time with their friends (peers), that peer-related motivation may in fact induce a reward system to respond to the reward value of risky behaviour. They conclude that 'as the cognitive-control system gradually matures over the course of the teenage years,

adolescents grow in their capacity to coordinate affect and cognition and to exercise self-regulation, even in emotionally arousing situations. These capacities are reflected in gradual growth in the capacity to resist peer influence.'

Albert et al. (2013) identified that the impact of peer influence on adolescent risk decision-making can be positively mitigated by changes to reward systems, which also effects a heightened stimulation in the brain's reward, temporarily influencing the cognitive-control system in youths. Somerville et al. (2011) found that adolescents developed an increase in their ventral striatal activity - rational thought functionality within the brain's limbic system and temporal lobe, creating activity within the hippocampus, rationalising emotional responses connected to pleasure and behavioural motivation - for adolescents in response to happy faces and facial stimuli. Albert et al. (2013) concluded that to remove the peer effect, other social cues are required - ones that will be embraced by adolescents - to supplant peer influence, which can create positive neural activity related to future performance. Pathway has been designed to cater for supplanting peer influence to instil logical and rational thought, and mitigate against critical adolescent life choices, particularly when it comes to future careers.

### **Accumulating Knowledge & Intellect to Complement Values**

When thinking about students as they reach their final years in secondary education, understanding cognitive development in adolescence provides valuable insight into seeing things from their perspective, and hence generate ideas to support them in this critical development stage. The brain of a child undergoes significant development during the adolescent phase, where some regions of the brain grow, as other regions decline. One area that develops rapidly is the prefrontal cortex driving changes in cognition, essentially the way they think (Cocchimiglio, 2021).

As students advance through adolescence, their capacity to take new knowledge on board increases. These include increases in three distinct areas of knowledge (Cocchimiglio, 2021):

- Declarative: stating of learned facts, anecdotes, and formulas.
- Procedural: understanding techniques to process learning of new knowledge.
- Conceptual: understanding of the 'why?' things are done in a certain way.

### **Enhancing Hypothetical Scenarios**

Adolescents develop the ability to imagine hypothetical situations at different rates, whether a social, learning and development situation. They have the capacity to visualise consequences and consequently make decisions about an approach to a particular situation, relative to the quality of their abstract and hypothetical reasoning.

It is important to consider, however, how adolescents process new information, relative to new knowledge. According to Cocchimiglio (2021), as adolescence progresses, young people start to process information they receive in the following ways:

- an increase in their ability to reason deductively;
- development of better decision-making skills;
- growth in working memory capacity and ability to retrieve memories increases;
- increased rationality in learning choices;
- increase in ability to learn independently.

### **Impact of Parenting on Decision-Making Styles in Adolescents**

According to Wolff and Crockett (2011), as decision-making is learned and applied in a social context within the home, adolescents learn from what they see from their parents through exploration of espoused values, beliefs, and attitudes, where this context enables 'comfort' styles within the growing adolescent. The second social context for this group is friends and school. Research conducted by Gati et al. (2010) suggests that the social context often educates youths to transition

across two different types of decision-making styles - a primary one, from home, and a secondary one, from friends and school. Consequently, the emergence of maturing and positive decision-making styles is directly linked with positive parenting skills (Davids et al., 2016), as parenting methods play a pivotal role in youth social development and predicated future behavioural outcomes. Research across different cultures has found many variations in this (Supple and Small, 2006), where Western societies promote parenting that display warmth and promote autonomy, while parenting in Asian societies promote more restrictive and authoritarian parenting. As such, the adolescent decision-making style development will be more restricted in Asian societies.

### **Logotherapy - Creating Awareness Around a Sense of Purpose**

Frankl's (1959) principles of logotherapy set out a premise that each individual has a primary motivational force: that is to find their meaning in life, essentially their purpose, a premise that embraces the confluence of physical, psychological, and spiritual characteristics of the human being, expressed through how an individual operates. It can be considered in perspective with other, more established and contemporary interventions (Ameli & Dattilio, 2013; McMullin, 2000), which collectively provide reference to the third 'P' in understanding human psychological motivation: firstly, considering Freud's "PLEASURE" underpinned and explained by his psychoanalysis techniques; secondly, there's Adler's "POWER," where striving for power is viewed as an individual goal to usurp a latent disposition of social interest; and thirdly, there's Frankl's logotherapy, our "PURPOSE", supporting a theory that we are motivated by an inner desire to search for meaning in life.

Hanna and Minton (2014) found from assessing guidance counselling from an Irish perspective that there is a requirement to nurture more responsible decision-making skills in students, as reflected in the new, national Junior Cycle Key Skills initiative. They suggest a meaning-centric philosophy to build responsible decision-making, one that is embraced across the entire school body, characterised by four foundational principles: self-control, self-insight, modelling, and goal setting, collectively representing the key features necessary to develop responsible decision-making. Embracing these interventions on a school-wide basis provides students and staff alike with the motivation to engage and participate, linking and identifying the significance of purpose with the criticality of decision-making.

### **Phenomenology: Consciousness and Perception**

Merleau-Ponty (1978) describes the subject of phenomenology as understanding the essence of context, including perception and consciousness, together with the perceptual contact we have with the world around us. Driven by our life experiences, perception guides all conscious thoughts, decisions, and actions. If we think of the world we live in as a sea of perception, then our cognisance of this, as humans, designates understanding and meaning to the world. The two are inseparable: our perceptions of the world and the level of consciousness we have. Merleau-Ponty (1978) contends that the competing principles of empiricism and rationalism, traditional reference points for rationalising perceptions, do not sufficiently represent the deeper meaning necessary to describe what he articulates as the "the phenomenology of perception". This is because empiricism rationalises human experience as the most important and significant source of knowledge, established from a multitude of sensory perceptions. Rationalism, on the other hand, he proposes is about having a "reason to act" as the most important and significant source of pragmatic knowledge, something innate that does not require or rely on our sensory perceptions.

Merleau-Ponty (1978) contends that individual judgment is a perception of the relationship between different aspects of perception: engaging sensory perceptions to create a logical interpretation of the signs, or alternatively, using logic to make sense of sensory perceptions. Either way, judgment is an activity that is neither uniquely logical nor sensory and may embrace and surpass both reason

and experience. In calling upon experience, this can be either reflective, being aware of and rationalising the experience; or unreflective, also known as subsequent reflection.

Consciousness exists to translate salient, sensory data for future spontaneous application in excess of its apparent significance (Merleau-Ponty, 1978) where perceptual objects have two fields of reference: an inner horizon in self-consciousness and an outer horizon linked with the outside world, with an object-horizon structure enabling an individual to differentiate objects from each other. Both horizons present different relative levels of significance. Collating Merleau-Ponty's theory suggests that if the salient thoughts of school-going teenagers can be rationalised to create clearer perceptions around career choices, especially when their brains are still developing, then this can positively shape a trusted "horizon of significance" to engage in communication with students in a way that they can connect with, one that will positively influence relevancy and enhance their perception, judgement and ultimately their career decision-making process.

### **Career Choice Influencing Factors**

There is significant research on the impact of both intrinsic and extrinsic factors when it comes to career decisions (Bandura et al., 2001; Kerka, 2000; McQuaid & Bond, 2003). The primary intrinsic factors include: an individual's decision-making style; their values and beliefs, their core interests, how they see themselves through self-reflection, their attitudes towards other people and the world; as well as their own cultural DNA. Looking, at the primary extrinsic factors, these cover their social network of friends and family; who they perceive as role models; the salience of information on capital, healthcare, globalisation trends, ethnic diversity, educational accomplishments; their subject predilections; as well as the characteristics associated with different career and role opportunities. Students, when thinking about career choices, are influenced differently, according to Hewit (2010). Some are influenced quite strongly by the perception of different professions as articulated to them by their parents, often linked with the educational achievements from those professions. Conversely, some students are inspired by careers and roles that are more mercantile in nature, offering better remuneration and benefits. There are also those who choose a career aligned with their passion in life, irrespective of its perceived prosperity. Other extrinsic influencing factors include peers, friends, relatives, role models, and teachers especially career counsellors.

## **3.0 The Pathway Model**

### **Self-Reflection, The Future and Understanding Others**

From the researchers' experiences, adolescents generally spend more time thinking about themselves when compared to adults as they are a very impressionable age. And while this may appear somewhat selfish relative to a more mature adult, it is critical that they are afforded the opportunity to allow this time for self-reflection, without judgment from adults, be it their parents, career guidance counsellors or from teachers. Pathway provides a portal for self-reflection, accelerating knowledge that may take years to accumulate without an intervention. As adults, we have all taken psychometric assessments at some point in our lives, connected with our businesses or organisations we work in, and have developed from these interventions. Early, intervention from Pathway can help students develop a stronger sense of who they really are and what it is they want from life. It also creates objective conversations about options, ideas, and possibilities.

Accelerated cognitive development in adolescents through participation in the Pathway survey helps prepare students for future careers discussions, as well as enhancing relationships with peers and adults, as it builds confidence around self-worth and value. During the later period in adolescence, students start to thinking about the possibilities that lie ahead in a career, benchmarking those careers to their beliefs, values, and ideals. Whilst they are aware of the significant consequences of life choice decision linked to career options, without appropriate tools to guide them they are comfortable to defer such choices. It is healthy for both students and for

parents that the student establishes goals and objectives before they finish adolescence and commence their adult lives.

Understanding their own psychological characteristics, as well as those of their peers is a catalyst to allow them to think more abstractly, understanding that everyone's decision-making style is different. Without understanding how people fit into different quadrants of thinking, they can make guesses about how others think. With Pathway, these guesses become more robust, informed, and assertive, building further confidence, as this new knowledge will help them decide on how best to engage with different people, based on the assessment of the other person's decision-making style, and how it differs from their own.

As adolescents often base their choice of friends based on alignment of similar psychological characteristics, as well as commonality of values, awareness about diversity of other decision-making styles offers wider thoughts that mitigate priming biases against others and enhances greater diversity and inclusion, a critical component of successful, sustainable relationships.

### **Decision Making Linked with Stress and Anxiety**

Several reflective observations from the researchers' own experiences in this area can be summarised to add context when linking decision-making with stress and anxiety. In a stress related situation, the prefrontal cortex interprets sight and sound signals and assesses level of danger, together with the Thalamus, which interprets the senses. The emotional part of the brain, the Amygdala, then triggers the fear response based on perceived level of threat, producing the stress hormone, cortisol. A classic anxiety response is then initiated in your body immediately, through the unconscious brain, resulting in rapid heartbeat, increase in blood pressure, sweating, loss of appetite. The Hippocampus, which is the memory storage centre of the brain – the conscious, rational part of the brain kicks in action to fight off the cortisol. The more stored memory and experiences you have, the easier it is for the hippocampus to reduce anxiety, and hence reduce stress. The more stressful situations you have encountered in your career and learned from, the larger the data bank of experience and knowledge to draw from within your hippocampus. As the activation of the amygdala sets off chemically charged signals to our nervous system, where two competing parts of our central nervous system compete against one another, this is what creates anxiety, at least until the rational thinking kicks in. Now fear can be a good thing, as it helps us to survive and react accordingly. These competing parts, however, create tension throughout our bodies. One part tells the body there is a threat and sets off alarm signals, driving our adrenal glands to produce more and more cortisol, the other telling it that it's ok.

When we compare this cognitive processing to a teenager's brain, the part of the brain that responds to situations with good judgment and an awareness of long-term consequences, the hippocampus, which has not yet fully developed. Teens process information with the amygdala, the fear orientated, emotional part of the brain. Adolescent cognitive processing continues to evolve to adulthood, as the connections between the emotional part of the brain (the amygdala) and the decision-making centre (the pre-frontal cortex) are still developing – and often at different rates – depending on the development of the rational part of the brain (the hippocampus). That is why we often see teens having a cathartic reaction to something that an adult sees as trivial. This is because their reaction is feeling-based, as opposed to thinking-based.

Being skilled in slow thinking, when slow thinking is required, is a function of the development and application of stored brain memory and experiences from within the temporal lobe's hippocampus. This helps explain why younger adults and students appear to spend more time operating in fast thinking mode when slow thinking is required. As the brain develops, and learned memories accumulate, expanding knowledge cells within the hippocampus, so too does the advent of slow thinking. Ingenium's research has found that Directive decision-makers spend more time thinking

fast, hence being aware of styles that support fast thinking can 'interrupt' poor decisions made quickly, especially so for students.

### **Developing the Pathway Model**

Considering the practical implications in summarising all the elements discussed, the Pathway model design has been consolidated to cater for a number of emerging needs with adolescent students as they approach their final years in secondary education. These areas are summarised below:

- Enhance hypothetical thinking in adolescents to help accelerate knowledge application through to the fourth phase of adolescent development depicted by Piaget's (1972, 2006) 'formal operations', boosting abstract thinking, logical reasoning and problem-solving skills.
- Help students to build prefrontal cortex thinking and conceptualise the hypotheticals, critical to achieving adolescent maturity and being open to embracing Declarative, Procedural and Conceptual knowledge, as highlighted by Cocchimiglio (2021).
- Provide the career knowledge, mentoring and socialisation of careers discussion that students desire, highlighted by Nyamwange (2016).
- Provide a tool, to simplify a complex series of brain functions, deployed when we students are faced with prevailing opportunities, challenges, and uncertainties in life, as highlighted by Hammond (2010) as critical to good decision-making.
- Translate the 'part science' and 'part art' in decision-making, articulated by Kreitner and Kinicki (2012), and focus on career critical decisions, acknowledging the quantum of distractions in students' daily lives.
- Provide students with a picture of their foundational cognitive profile through their own unique decision-making style, founded in innate values, influenced by what they see and learn, together with an awareness around other styles to help individuals make better decisions and engage better with others, as highlighted by several researchers (Rowe and Mason, 1987; Rowe and Boulgarides, 1994; Ozutrk et al., 2011)
- Create awareness about future learning and embrace that learning to make better decisions, as highlighted by Rayner and Cools (2010).
- Create better judgement through awareness of biases and Fast and Slow Thinking, enhancing cognitive processing, as articulated by Kahneman (2011).
- Create awareness around the influence of social and emotional factors on adolescent decision making, including risk-taking propensity with capacity to resist peer influence, balancing socio-emotional reward systems with cognitive-control, as highlighted by different researchers (Albert et al., 2013; Somerville et al., 2011).
- Enable a meaning-centric philosophy to build responsible decision-making, one that defines purpose (Frankl's, 1959; Hanna and Minton, 2014).
- Enable the creation of a trusted "horizon of significance", as proposed by Merleau-Ponty (1978), where relative levels of significance to salience and perception can be rationalised.

Considering these practical implications, together with their application, Figure 5.0 summarises the collection of constructs used to create the Pathway model, covering Decision-Making Style Development; School & Social Learning & Development; Third Level Learning & Social Interaction; all landing on Career Choices.

Considering the primary intrinsic factors in people's development as a function of appreciating, understanding, collecting, and assessing the foundational values and beliefs espoused from parents and upbringing are key. Similarly, attitudes established from social interaction of values in a familial context, together with the learned behaviours that facilitate these values and attitudes being espoused need to be considered. Additionally, how students see themselves through understanding their own decision-making style from all of the above to help provide self-reflection, linked with their own cultural DNA, needs to merge a foundational intrinsic cognitive outlook. As

part of this, creating awareness around self-reflection, should include a summary around the strengths and opportunities associated with different decision-making styles.

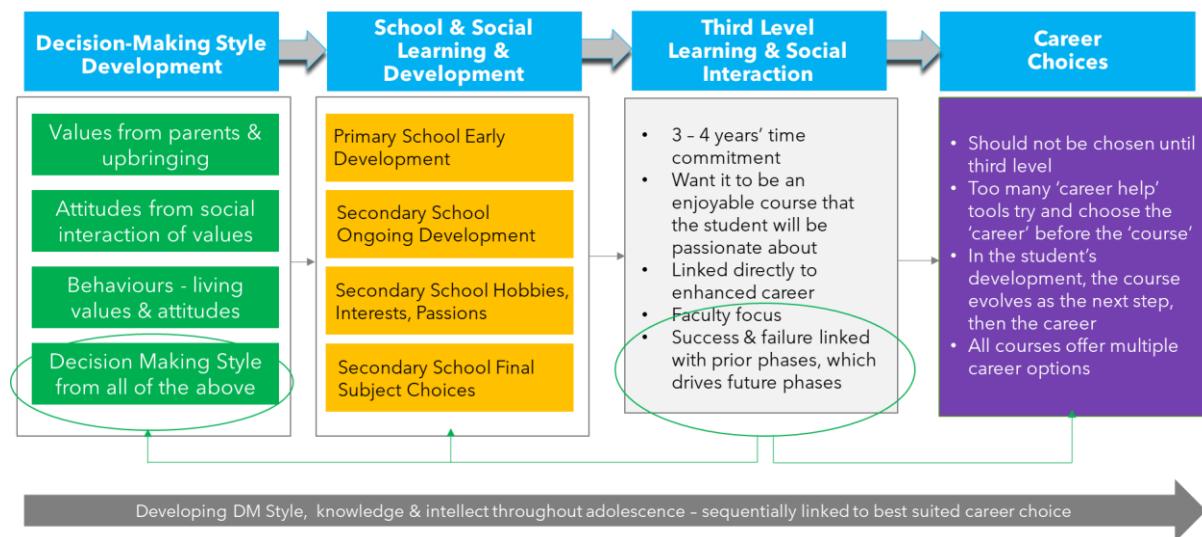


Figure 5.0: Pathway Model Constructs

Looking at how school learning and development, together with the social interactions and engagement with teachers and peers, refining and accentuating specific and general attitudes and behaviours needs to be considered. These additional cognitive forming perspectives will be through assessing and understanding the accumulation of new knowledge and intellect that complement values. This covers the periods from primary school early development to ongoing secondary school development. To translate this into an enjoyable and sustainable career, three areas that the student needs to consider emerge: (1) Hobbies: the things that he or she loves doing and would really like to take with them into their careers; (2) Core Interests: the things happening in the world around the student that catches their interest and attention; and (3) Passions: the things that the student really cares about in life, reflected in attitudes towards other people and the world. Some extrinsic factors that need to be considered here include the perception of different professions with supporting information; the students' subject predilections, as well as the characteristics associated with different career and role opportunities. This is particularly important in the final two years of secondary school, when final subject choices are made, forging a blueprint for career selection.

Committing to third level is a significant investment in a student's time. It is between three to four years' commitment in time – a perception of lifetime for some – so it is something that needs to be considered carefully. Not only will it need to link with the two precedent streams, considerations around the environment for learning and social interaction need to be assessed. Student's will want it to be an enjoyable course that they are passionate about so they can see and experience the direct links to an enhanced career. This requires and understanding and assessment of the various faculties, covering Engineering & Technology, Business, Arts, Science, Health and Education. This element links the success of career choices from prior phases to drive enjoyment in future phases.

### **Career Choices**

The final career choice that postgraduate students are required to make is not taken until third level is completed, as too many 'career help' tools try and choose the 'career' before the 'course'. In the student's development, the course evolves as the next step, then the career, as all courses offer multiple career options, many of which evolve. It is like the tee shot in golf – a few inches off at the outset and you are in the weeds; and whilst it is important to think about your second shot, the success of completing a hole lies in the tee shot – in this case, the choice of third level course. The ongoing development of people, through internalisation of knowledge and demonstration of intellect throughout life is all sequentially linked to best suited career choice. For students, socialising

the constructs of Pathway supports the development of other extrinsic factors, including engagement with friends, family, and linking with role models.

Translating these constructs into a model required the consolidation of all conventional decision-making theory elements developed from the research into a logical, flowing sequence, and done in a way that students would enjoy completing. As referenced earlier, a significant part of this research included engagement with students to solicit their feedback on how a survey and report out should look and feel. Figure 6.0 summarises the Pathway model consolidation, built around a student-version decision-making inventory styles approach, whilst incorporating all other internal intrinsic and external intrinsic factors discussed.

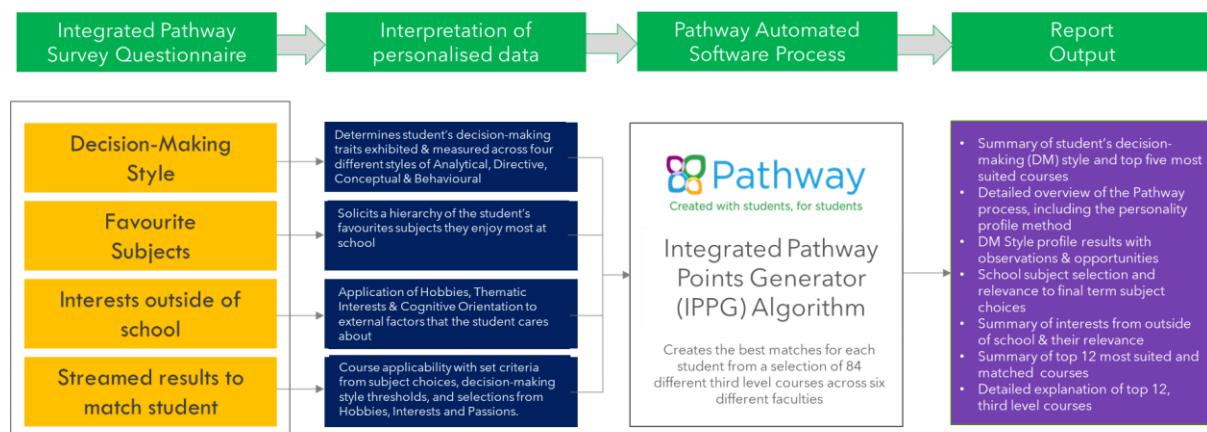


Figure 6.0: The Pathway Model Development

The first two areas of the model included the Integrated Pathway Survey Questionnaire and Interpretation of personalised data. In consolidating the Pathway Model, each of the following areas were considered and incorporated:

- Students' favourite subjects' assessment by soliciting a hierarchy of each student's favourite subject preferences that they enjoy the most at school.
- Students' decision-making style assessment, assessed through a range of style combinations, using the modified student inventory survey process. This facilitated the determination of each student's decision-making style traits – from a values' and learned behaviours' approach – exhibited and measured across four different styles of: Analytical, Directive, Conceptual and Behavioural. Students enjoyed the simplicity of the model's presentation, underpinned by its academic rigour.
- Student's hobbies, interests, and passions. These included career reflections that consider the student's future application of their hobbies, together with a selection of diverse thematic interests salient in today's world for students to consider their relationship with, as well as a selection of scenarios from which the student can select what they care about the most in life, representing their passions in cognitive orientation relative to extrinsic factors.
- Student specific course qualification criteria from the first three Pathway components, which allows courses to be streamed to best match students. This is built around course applicability with set criteria from subject choices, decision-making style thresholds, and selections from hobbies, interests, and passions.

Using these four areas of reference, an Integrated Pathway Points Generator (IPPG) Algorithm was developed, tested, and then converted to an online Automated Pathway Software Process, designed to create a unique engagement experience for each student that tales Pathway, consolidating their top 12 most-suited third level courses from a selection of 84 different third level courses across six different faculties. The automated survey process has been designed to provide feedback on both the strengths and opportunities associated with each style to allow the student to self-reflect on their

style and help create enhanced visualisation around the hypothetical scenarios experienced with their styles.

The report output, a sample of which can be viewed on our Pathway website at <https://mypathwayjourney.com/students/> includes a detailed overview of the decision-making style profile and methodology, a detailed explanation of the Pathway process, the student's unique decision-making style profile results with observations around strengths and opportunities, school subject selection and relevance to final term subject and third level course choices, a summary of hobbies, interests and passions from outside of school with relevance to third level options, concluding with a detailed explanation of the top 12 third level courses most suited to the student.

## 4.0 Research Method

Global research was carried out on over 250 different university and third level institutions worldwide to review courses and programs offered. Courses of a similar nature were merged to consolidate 84 uniquely identified courses, across six different faculty areas, including:

- Engineering & Technology
- Business
- Arts
- Science
- Health
- Education

To correlate the 84 courses across the four different survey components, a series of weighted bivariate tables were created, one for each of the four survey components. In each of these cases, the 84 different courses are selected as the dependent variable, placed in rows, and referenced against four separate, independent variable tables, represented in columns, one for each of the following:

- Student's favourite subjects' assessment
- Student's decision-making style combinations.
- Student's hobbies, interests, and passions
- Student specific course qualification criteria from three Pathway components

This four-part assessment process is called the 'Integrated Pathway Points Generator' or IPPG, designed as a method for assigning a hierarchy of value towards each course, relative to each individual student. In this process each row and column, representing dependent and independent variables respectively, intersect at cells, where a pre-determined weighted value forms part of the value to create a series of bivariate table cumulative marginals, through the Integrated Pathway Points Generator (IPPG) process, which facilitates the correlation of relationships between the two data streams. This is outlined in table 1.0.

To develop and apply empirical multipliers and independent variable weightings, a pre-testing IPPG pilot phase was carried out with 22 students to validate IPPG multipliers and constants through an iterative process that took place between March 2017 and August 2018. Pathway includes a total of 144 independent variables, made up of 26 different secondary school subjects, 4 different decision-making style combinations, 54 hobbies, interests, and passions, and 60 association rules. During the pilot phase, these were correlated against 84 third level university degrees, as dependent variables. Following this, the pilot group of students became part of the overall group of 412 students tested in the formal testing process.

Table 1.0: Weighted Bivariate Pathway IPPG Correlation

IPPG Generator	Independent Variables				Cumulative Points (IPPG)
Dependent Variables	Favourite Subjects	Decision Making Styles	Hobbies, Interests & Passions	Qualification	
<b>Course 1</b>	26 Secondary School subjects, each with student generated multipliers ( $M_i$ ), developed following hierarchy of selection by students based on subject ranking.	4 different % graded decision-making style combinations with multipliers ( $M_j$ ) calculated from decision making inventory results across each quadrant, based on student's responses.	54 elements from menu of 'Hobbies, Interests & Passions', each assigned a multiple $M_n = 1$ when element selected by student, with non-selection element default $M_n = 0$ .	Application of course applicability for student based on achievement of pre set minimum criteria from subject choices, decision-making style thresholds, and selections from Hobbies, Interests and Passions from 60 Association Rules.	Integrated Pathway Points Generator (IPPG) cumulative sum from four precedent streams, with a hierarchy established per course
	Pre set, weighted base points ( $P_i$ ), assessed based on relationship between each school subject and course 1.	Pre set, weighted base points ( $P_j$ ), assessed based on relationship between each decision making style combination and course 1. Normalised by factor ( $k$ ) to align with impact on result from subjects.	Pre set, weighted base points ( $P_n$ ), assessed based on relationship between each component of 'Hobbies, Interests & Passions' and course 1.	Calculation of binary multiplier, $Q=1$ based on achievement of pre set minimum criteria on certain subject choices, decision-making style thresholds, and sections from Hobbies, Interests and Passions, relative to Course 1. $Q=0$ if criteria not met.	Course 1 Stream: $[M_i (1-26) \times P_i (1-26) + [M_j (1-4) \times P_j (1-4)] \times k + M_n (1-54) \times P_n (1-54)] \times Q (1-60)$
<b>Course 2</b>	Pre set, weighted base points ( $P_i$ ), assessed based on relationship between each school subject and course 2.	Pre set, weighted base points ( $P_j$ ), assessed based on relationship between each decision making style combination and course 2. Normalised by factor ( $k$ ) to align with impact on result from subjects.	Pre set, weighted base points ( $P_n$ ), assessed based on relationship between each component of 'Hobbies, Interests & Passions' and course 2.	Calculation of binary multiplier, $Q=1$ based on achievement of pre set minimum criteria on certain subject choices, decision-making style thresholds, and sections from Hobbies, Interests and Passions, relative to Course 2. $Q=0$ if criteria not met.	Course 2 Stream: $[M_i (1-26) \times P_i (1-26) + [M_j (1-4) \times P_j (1-4)] \times k + M_n (1-54) \times P_n (1-54)] \times Q (1-60)$
<b>Course 3</b>	Pre set, weighted base points ( $P_i$ ), assessed based on relationship between each school subject and course 3.	Pre set, weighted base points ( $P_j$ ), assessed based on relationship between each decision making style combination and course 3. Normalised by factor ( $k$ ) to align with impact on result from subjects.	Pre set, weighted base points ( $P_n$ ), assessed based on relationship between each component of 'Hobbies, Interests & Passions' and course 3.	Calculation of binary multiplier, $Q=1$ based on achievement of pre set minimum criteria on certain subject choices, decision-making style thresholds, and sections from Hobbies, Interests and Passions, relative to Course 3. $Q=0$ if criteria not met.	Course 3 Stream: $[M_i (1-26) \times P_i (1-26) + [M_j (1-4) \times P_j (1-4)] \times k + M_n (1-54) \times P_n (1-54)] \times Q (1-60)$
.....					
<b>Course 84</b>	Pre set, weighted base points ( $P_i$ ), assessed based on relationship between each school subject and course 84.	Pre set, weighted base points ( $P_j$ ), assessed based on relationship between each decision making style combination and course 84. Normalised by factor ( $k$ ) to align with impact on result from subjects.	Pre set, weighted base points ( $P_n$ ), assessed based on relationship between each component of 'Hobbies, Interests & Passions' and course 84.	Calculation of binary multiplier, $Q=1$ based on achievement of pre set minimum criteria on certain subject choices, decision-making style thresholds, and sections from Hobbies, Interests and Passions, relative to Course 84. $Q=0$ if criteria not met.	Course 84 Stream: $[M_i (1-26) \times P_i (1-26) + [M_j (1-4) \times P_j (1-4)] \times k + M_n (1-54) \times P_n (1-54)] \times Q (1-60)$

## Student's Favourite Subjects' Assessment

Following research into available school subject choices for the final cycle in secondary school a total of 26 different subject options were consolidated and incorporated into the IPPG process. These cover all science, maths, business, tactile learning subjects, and language options, incorporated into the Pathway model where students apply their subject preference to create a ranking. On carrying out the survey, students are asked to rank each of their subjects, up to a maximum of eight (8), from most favoured to least favoured. This assessment sets up a weighted distribution of student generated multipliers ( $M_i$ ), where  $i = 1.6, 1.4, 1.2... 0.2$ , with the highest value assigned to the most favoured subject. These multipliers were determined iteratively and empirically during the pilot research pre-testing phase to bring the appropriate impact and weighting from the subject's stream into the overall IPPG.

In each case, for each subject acting as the independent variable, pre-set, weighted base points ( $P_i$ ), where  $i = 1$  to 14, are pre-established within each of the bivariate cells, where subjects with a  $P_i = 14$  represent the highest possible association with the relevant course. The value range of 1-14 was established through iterative application during the research period and found to provide a suitable bandwidth of weightings for the range of the school subjects independent variable, linked with the dependent variable listing. The  $P_i$  distribution was developed iteratively and empirically during the pilot research to bring the appropriate impact and weighting for each subject and third level course option, assessed based on the relationship between each school subject and third level course. The IPPG points generated from this first process are calculated through the formula  $M_i (1-26) \times P_i (1-26)$  for each course, representing the first component of the independent variable assessment, completed for each of the 84 course options.

### **Student Decision-Making Style Combinations**

To augment the impact of a student's decision-making style into the IPPG process, the completion of the validated, decision-making inventory survey is used. On completion of the survey, four (4) distinct percentage measures of different decision-making styles are generated, unique to each student. Each % graded decision-making style combination creates a multiplier stream ( $M_j$ ), calculated from decision making inventory results across each quadrant, based on each student's response, creating an assigned value for each of the style types: Analytical, Directive, Conceptual and Behavioural.

In each case, for each of the four decision-making tendencies acting as the next independent variable distribution, pre-set, weighted base points ( $P_j$ ), where  $j = 1$  to 14, are pre-established within each of the bivariate cells, where decision-making style tendencies with  $P_j = 14$  represent the highest possible association with the relevant course. Again, the value range of 1-14 was established through iterative application during the research period and found to provide a suitable bandwidth of weightings for the range of decision-making styles, linked with the dependent variable listing. The  $P_j$  distribution was developed iteratively and empirically during the pilot research to bring the appropriate impact and weighting for each decision-making tendency, applied to each third level course option, assessed based on the relationship between the two streams. To ensure the correct weighting of impact from the decision-making style tendencies is incorporated within the overall IPPG framework, the cumulative marginal values from this stream were normalised by factor ( $k=2.85$ ), to align with the impact of the observed results from the first subjects' stream. The IPPG points generated from this second process is measured through the formula  $[M_j (1-4) \times P_j (1-4)] \times k$ , as the second component stream of the independent variable assessment, completed for each of the 84 course options. The  $k$  value was established through iterative application during the research period and found to provide a suitable comparative weighting for the contribution of decision-making styles when assessed in concert with other independent variables.

### **Student's Hobbies, Interests and Passions**

To incorporate the impact of the student's hobbies, interests, and passions into the IPPG process, the completion of the 'Hobbies, Interests & Passions' part of Pathway survey is used. This includes 54 elements across the three areas of 'Hobbies, Interests & Passions'. On completion of the survey, each of the 54 elements within the 'Hobbies, Interests & Passions' menu, are each assigned a multiple  $M_n$ , where  $M_n = 1$  when the element is selected by the student, and  $M_n = 0$  when the student does not select this element.

In each case, for each of the 54 elements within the 'Hobbies, Interests & Passions' menu acting as the independent variable distribution, pre-set, weighted base points ( $P_n$ ), where  $n = 1$  to 8, are pre-established within each of the bivariate cells, where 'Hobbies, Interests & Passions' with a  $P_n = 8$  represent the highest possible association with the relevant course. The  $P_n$  distribution was developed iteratively and empirically during the pilot research to bring the appropriate impact and weighting for each of the 'Hobbies, Interests & Passions' together with each of third level course options, assessed based on relationship between the two streams. The IPPG points generated from this third process is measured through the formula  $M_n (1-54) \times P_n (1-54)$ , as the third component of the independent variable stream assessment, completed for each of the 84 course options.

### **Student Specific Course Qualification Criteria from Three Pathway Components**

The fourth and final phase of the IPPG algorithm is to consider the applicability of all of the third level courses from within the list of 84 for each particular student. This final filtering process is achieved based on the achievement of pre-set minimum criteria from subject choices, decision-making style thresholds, and selections from Hobbies, Interests and Passions through the application of 60 different 'association rules'. Some example association rules include: if a student selects maths as their least favourite subject, then all engineering courses are discounted; if a student's decision-

making style shows behavioural empathy of less than 20%, then all courses in psychology and sociology are discounted; if a student does not select 'Appreciation of Animals' as one of the 54 elements in the 'Hobbies, Interests & Passions' menu, then Veterinary Science as a course option is discounted. The 60 different association rules were developed during the initial pilot phase testing through iterative testing and empirical development. These have been consolidated and applied as part of the IPPG algorithm.

To cater for this final filtration process, a binary multiplier, Q is used. Where the student's survey input information meets the association rule, then Q=1. This is based on achievement of the pre-set, minimum criteria 'association rules' on certain subject choices, decision-making style thresholds, and sections from Hobbies, Interests and Passions, relative to each particular course. When the student's survey input information does not meet the association rule, then Q=0 for that particular third level course.

In summary, the Integrated Pathway Points Generator (IPPG) cumulative marginal sum from four precedent streams, with a hierarchy established per course is calculated as follows:

$$[Mi \text{ (1-26)} \times Pi \text{ (1-26)} + [Mj \text{ (1-4)} \times Pj \text{ (1-4)}] \times k + Mn \text{ (1-54)} \times Pn \text{ (1-54)}] \times Q \text{ (1-60)}$$

## 4.0 Results

Research carried out with 412 students from across multiple schools and regions in Ireland between the periods March 2017 and March 2021 allowed the researchers to validate the integrated three-part survey tool, anchored to the academically validated decision-making styles foundational theory and assimilated to consolidate the Pathway model. This research was carried out in two phases: (1) a pilot phase to allow researchers determine a range of empirical multipliers to be incorporated into the Pathway model - from March 2017 to August 2018, carried out with 22 students through a series of iterative reviews; and (2) a testing phase of the Pathway model - from September 2018 to March 2021.

Table 2.0: Pathway Research Results

### Pathway Research Survey Results Summary

412 Pool Size - Number of Students



No.	Question	Yes	%	No	%
1	After studying your Pathway report, would you say that the decision-making style portrayed for you matches the way you think & make choices?	409	99.3%	3	0.7%
2	Do you agree with the areas identified as your strengths and opportunities for development and do they help to self-reflect?	408	99.0%	4	1.0%
3	After studying your Pathway report, would you say that the courses recommended by Pathway suit you?	409	99.3%	3	0.7%
4	Have you ever seen or used a tool like Pathway previously?	14	3.4%	398	96.6%
5	Were you considering any of the courses before you read your Pathway results?	88	21.4%	324	78.6%
6	Will you be considering all of your recommended Pathway courses now that you're aware of these opportunities?	412	100.0%	0	0.0%
7	Would you recommend Pathway to your friends and siblings?	409	99.3%	3	0.7%
8	Did you find the process of completing the Pathway survey straightforward?	407	98.8%	5	1.2%
9	Did you find the process of completing the Pathway survey thought-provoking?	409	99.3%	3	0.7%
10	On a scale of 1-5, how useful did you find the Pathway survey and report? (5 Extremely; 4; Very Useful; 3 Useful; Somewhat Useful; Not Useful)	1 2 3 4 5	0.00% 0.00% 0.24% 1.94% 97.82%		

Of the 412 participants in our research pool, this was made up of 218 females and 194 males. All participating students, aged between 16 and 21, completed the full Pathway survey, following which they received their individual Pathway reports. Individual interviews were then carried out with each student, to explain the report and answer any queries raised. Following these interviews, all students were asked to take part in a 10-point survey to assess the feedback on the Pathway survey process. See a summary of the results in table 2.0 below.

An analysis of all of the responses received from participating students from the 10-point Pathway assessment survey is summarised below. This survey was conducted after students had reviewed their individual Pathway reports and any clarifications raised answered.

**Q1: After studying your Pathway report, would you say that the decision-making style portrayed for you matches the way you think & make choices?**

This question was posed in order to ascertain if participating students felt that their decision-making styles were correctly and adequately described within their individual Pathway reports, as presented through their decision-making styles. From the feedback, 99.3% (409 participants) said yes, they felt that the overview provided a correct and clear presentation, supported by a series of diagnostic models. Conversely, 0.7% of the population (3 participants) said no, they did not feel the decision-making style profile was correct.

**Q2: Do you agree with the areas identified as your strengths and opportunities for development?**

This question was posed in order to ascertain if the narratives offered within the Pathway report around the participating students' strengths and opportunities for improvement, supported the participating students in being able to self-reflect on their decision-making style and learn something about themselves. From the feedback, 99% (408 participants) said yes, the strengths and opportunities articulated resonated, providing an opportunity for self-reflection. Conversely, only 1% (4 participants) said no, they did not feel that the strengths and opportunities provided a platform for self-reflection.

**Q3: After studying your Pathway report, would you say that the courses recommended by Pathway suit you?**

This question was posed to assess how participating students specifically felt about the 12 shortlisted third level courses that Pathway recommended for them. From the feedback, 99.3% (409 participants) said yes, the courses recommend by Pathway resonated with them and 0.7% (3 participants) said no, the courses did not resonate well.

**Q4: Have you ever seen or used a tool like Pathway previously?**

This question was posed in order to understand if participating students had previously used a tool like Pathway. From the feedback, 3.4% (14 participants) said yes, they had used similar tools previously, while 96.6% (398 participants) said no. This suggests that whilst there are some psychometric-adapted career planning tools out there, significantly these are not being marketed or making their way to students.

**Q5: Were you considering any of the courses before you read your Pathway results?**

This question was posed to participating students in order to establish if, prior to completing the Pathway survey and receiving their personalised reports, the shortlisted course options included courses that the students were considering. From the feedback, 21.4% (88 participants) said yes, they were thinking about some or all of these courses already, and Pathway had confirmed these options. Conversely, 78.6% (324 participants) said they had not been seriously considering some or all of the recommended courses. From the subsequent qualitative interviews, it was clear that the

majority of students from this 78.6% group, whilst they had some ideas about potential courses, they had not seriously considered them in any great detail, as they were not clear or aware of what these courses meant. See Q6 feedback below, which helps clarify this point.

**Q6: Will you be considering all of your recommended Pathway courses now that you are aware of these opportunities?**

This question was posed in order to assess if participating students, following completion of the survey, and having reviewed their shortlisted courses, will be considering these courses identified by Pathway. From the feedback, a resounding 100% (412 participants) said yes, they would be considering the courses from Pathway, now that they were aware of them and their alignment to their favourite subjects, decision-making style and hobbies, interests, and passions.

**Q7: Would you recommend Pathway to your friends and siblings?**

This question was posed in order to understand the perceived value of Pathway to participating students to see if they would recommend the survey to others. From the feedback, 99.3% (409 participants) said yes, they would recommend Pathway to their friends and siblings. Only 0.7% (3 participants) said no, they would not recommend it.

**Q8: Did you find the process of completing the Pathway survey straightforward?**

This question was posed to participating students to determine how easy the survey process was to understand and to navigate. From the feedback, 98.8% (407 participants) said yes, they felt that the process was very straightforward and way. Conversely, 1.2% (5 participants) said that they did not find it straightforward.

**Q9: Did you find the process of completing the Pathway survey thought-provoking?**

This question was posed to participating students to see if the survey process introduced deeper thinking about the future, rationalising their decision-making style and favourite subjects, as well as the application of their hobbies, interests, and passions. From the feedback, 99.3% (409 participants) said yes, they found the survey process quite thought-provoking and made them think different. Conversely, 0.7% (3 participants) said that the survey did not provoke deeper thoughts.

**Q10: On a scale of 1-5, how useful did you find the Pathway survey and report? (5 Extremely; 4; Very Useful; 3 Useful; Somewhat Useful; Not Useful)**

This question was posed to determine the perceived level of usefulness of the Pathway survey and report from participating students. From the feedback, 97.82% (403 participants) said yes it was extremely useful, 1.94% (8 participants) said it was very useful, and 0.24% (1 participant) said it was useful.

Overall, these results provided the researchers with validity of Pathway, specifically that the tool, including the survey and the report, had a significantly positive impact on participating students. Almost all felt that their decision-making style was very accurately reflected, providing insightful feedback on strengths and opportunities for improvement and self-reflection; that their Pathway recommended courses suited their decision-making style and favourite subjects, as well as the application of their hobbies, interests, and passions; almost all had never experienced a tool like this before and participation significantly increased their awareness of courses that they would now definitely consider; that the survey process was easy to navigate, as well as thought-provoking; and overall, almost all participants found Pathway extremely useful and something that they would recommend to their friends and siblings. These results confirm a significant positive correlation between the independent variables of participating students with the dependent variables careers.

## 5.0 Conclusions

Rowe and Mason (1987) contend some individuals think intuitively and others logically, some prefer acting to thinking, whilst others are concerned with people's feelings and some are only concerned with rules. A decision-making style reflects the combination of how an individual perceives and comprehends stimuli and the general manner in which he or she chooses to respond to such information, reflecting the balance between intrinsic and extrinsic variables that drive choices. Rowe and Boulgarides (1994) affirmed that there is a need to measure decision-making styles as 'individual decision-making styles form the backbone of effective decision-making', within any setting. Accordingly, it is essential to establish individual decision-making styles to critically support individual and developmental effectiveness as a reflection of decision-making style. The decision-making and cognitive thought process of an individual, seen by others through a combination of different styles, underpinned by values and learned behaviours, presents an external-facing version of an individual's decision-making style.

The results from the Pathway research identified significantly positive correlation between the participating students' favourite subjects, decision-making styles, hobbies, interests, and passions, represented as the independent variables, and the predicted third level courses and career initiatives, represented as the dependent variables.

Pathway has been proven to accurately predict students' decision-making styles in addition to providing insightful strengths and opportunities for improvement feedback to facilitate self-reflection. Pathway's validity is confirmed through the correlation between recommended courses suited to the combination of decision-making style and favourite subjects, as well as the application of their hobbies, interests, and passions.

Participating in Pathway provides value to students across a number of critical developmental areas:

- 1) Provides students with a picture of their foundational cognitive profile through their own unique decision-making style, founded in innate values, influenced by what they see and learn, together with an awareness around other styles to help individuals make better decisions and engage better with others.
- 2) Identifies the students' key strengths and opportunities for development, unique to their decision-making style.
- 3) Helps students to be aware of the decision-making styles of the others around them, in creating their emotional intelligence.
- 4) Helps establish a positive decision-making environment where the students can share in hypothetical thinking and discussions about their career options with all key stakeholders and help accelerate knowledge application through to the fourth phase of adolescent development 'formal operations', boosting abstract thinking, logical reasoning and problem-solving skills.
- 5) Helps students to achieve a balance in their decision-making styles, evaluate alternatives in the decision-making process, and consider the three key factors: risk, consequences, and feasibility.
- 6) Creates awareness around the influence of social and emotional factors on adolescent decision making, including risk-taking propensity with capacity to resist peer influence, balancing socio-emotional reward systems with cognitive-control, as highlighted by different researchers.
- 7) Helps students to build accelerated prefrontal cortex thinking and conceptualise the hypotheticals, critical to achieving adolescent maturity and being open to embracing Declarative, Procedural and Conceptual knowledge.
- 8) Provides students with a tool that simplifies the complex series of brain functions when we students are faced with prevailing opportunities, challenges, and uncertainties in life.

- 9) Translates the 'part science' - 'part art' in decision-making to provide focus on career critical decisions, acknowledging the quantum of distractions in students' daily lives.
- 10) Creates awareness about the benefits of future learning to help embrace new learning to make better decisions.
- 11) Creates better judgement through awareness of biases and Fast and Slow Thinking, enhancing cognitive processing.
- 12) Aligns students' subject and hobby predilections, decision-making style characteristics, interests and passions with different career and role opportunities, forging a blueprint for career selection.
- 13) Provides the career knowledge, mentoring and socialisation of careers discussion that students desire.
- 14) Enables student to develop a meaning-centric philosophy to build responsible decision-making, one that defines purpose.
- 15) Enables students to create a trusted "horizon of significance", where relative levels of significance to salience and perception can be rationalised.

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