

Cognadev Technical Report Series

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Increasing age and changes in CPP preferred cognitive style across job families

In this investigation, we look at how preferred cognitive styles vary over different job families and age-groups, equated on their educational level. A sample of the most recently acquired 60,572 cases of CPP data were used, subdivided into four age groups (20-29, 30-39, 40-49, 50 and above). We computed the median ranked style for each of the 14 CPP cognitive styles, within each age-group, across 10 job families.



Executive Summary

- In this investigation, we looked at how preferred cognitive styles vary over different job families and age-groups, equated on their education.
- A sample of the most recently acquired 60,572 cases of CPP data were used, subdivided into four age groups (20-29, 30-39, 40-49, 50 and above), analysing either those cases possessing a single degree qualification, or those cases possessing multiple and postgraduate degree qualifications.
- The five cognitive styles which best differentiate between the age and career group in the single degree group are the [Explorative](#), [Memory](#), [Metaphoric](#), [Random / Trial-and-error](#), [Impulsive / Reactive](#) approaches.
- The four cognitive styles which best differentiate between the age and career group in the multiple degree group are the [Explorative](#), [Memory](#), [Random / Trial-and-error](#), [Impulsive / Reactive](#) approaches.
- CPP ranked preferred cognitive styles show some interesting and intuitively appealing trends across age and job families. In the both degree groups, the 'standout' finding is that a preference for a more undirected action, reliance on previous experience (memory), and impulsive (quick closure) approach to decision-making is more prevalent among older-aged groups within job families which do not incorporate a substantive technical component (such as Engineering and Manufacturing).
- These results further substantiate the findings of several previous studies on both strategic effectiveness and on the predictive validity of the CPP, where these cognitive styles have indicated a somewhat operational and less effective information processing approach than that associated with the Logical, Integrative, Holistic, Learning and Quick Insight styles.

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1. The Cognitive Process Profile (CPP) assessment

The CPP measures a person's cognitive preferences and capabilities by means of a simulation exercise which was designed to externalise and track thinking processes according to thousands of measurement points. The results are analysed by an expert system and automated reports are generated. The CPP primarily measures the following constructs: information processing competencies, cognitive styles, units of information, learning potential, a suitable working environment, as well as cognitive strengths and development areas.

1.1 The CPP's Cognitive Styles

The cognitive styles as measured by the CPP primarily describe the cognitive preferences a person shows in dealing with unfamiliar information. However, it is highly likely that the person will generally apply those same stylistic preferences in familiar contexts also. Cognitive styles can be described as broad cognitive response tendencies and should be understood as the most frequent behaviour during the assessment.

The definition of the particular styles may not be exactly what is generally in layman's terms associated with the title word. Logical style, for example, implies disciplined thinking in a consequential and process-based manner to transform information structures or to identify implications and consequences. This goes beyond the meaning of the layman's term "logical".

A person's stylistic preferences can be magnified by certain personality and environmental factors as well as value orientations. An example is the Reflective style, which may indicate a level of caution, a risk avoidant personality trait, internalised cultural values or possible exposure to high risk or punitive environments where mistakes are not tolerated. Certain stylistic tendencies are also reinforced or adopted in certain educational and work environments. Examples include the highly analytical requirements of certain financial and scientific career fields, or the creative, intuitive, at times even random, ideas-oriented approaches required by arts and, to some extent, the social sciences. Preferences for the application of specific styles can thus be rooted in cognitive "values" or habitually applied metacognitive criteria. Included are the tendencies to strive for accuracy; the habit to suppress reactive responses in favour of being reflective; or the tendency to create certainty by approaching tasks in an ordered and structured manner.

Other than the information processing constructs, such as Exploration, which indicates effectiveness of processing, cognitive styles such as the Explorative Style, may merely indicate the tendency to explore irrespective of the effectiveness involved. Typical cognitive styles which fall into this category include the Explorative, Structured, Reflective, Random or Trail-and-Error and Memory styles. The Intuitive and Analytical styles can partly be grouped into this category as well.

However, the Logical, Integrative, Holistic and Learning styles, presuppose effectiveness of approach. These styles also involve dealing with complexity in an "inclusive" and metacognitively aware manner. Again, the Analytical and Intuitive styles can to some extent be added into this category.

Some examples of the CPP cognitive styles are presented below.

Table 1: Three example Cognitive Styles assessed within the CPP

Logical Style



- Tends to look for logical evidence
- Is self-aware and rigorously monitors own reasoning processes
- Follows reasoning processes through in a rule-based manner
- May apply convergent or divergent reasoning
- Tends to verify or falsify arguments logically
- May prefer to focus on complex issues and long-term implications
- Tends to be a disciplined and critical thinker
- May pursue complex cognitive challenges
- May focus on detail in an analytical manner

Analytical Style



- Has a precise, detailed approach
- Works systematically and pays attention to rules
- Enjoys pulling information apart and subdividing issues
- Analyses, compares and categorises various elements
- Identifies relationships between different elements

Trial-and-Error (Random) Style



- Has a vague and unsystematic approach to problem-solving
- Tends not to plan or monitor information processing approach
- May show an undirected action approach
- Not likely to be focused on the task or goal
- May lack self-awareness, motivation or flexibility
- Likely to prefer structured and familiar information or environments
- May not systematically analyse, structure or reason about issues

2. Sample Information

For the purposes of the current analysis, the most recently acquired 60,572 cases of CPP data were utilised; subdivided into four age groups (20-29, 30-39, 40-49, 50 and above) and only those cases who possessed a single degree qualification, or those cases possessing multiple postgraduate degree qualifications.

The median rank across all 14 styles of the two groups were then compared, where the lowest (1) ranked style is the least preferred, and the highest (14) is the most preferred/utilised.

Then, we compared these median rank styles across 10 job families. The job family data were self-reported by individuals being assessed using the CPP, as part of the biodata collected from respondents. The self-reporting was semi free-response, resulting in 126 unique entries for the biodata field, which were recoded into the final 10 broad categories via a 2-pass computational “if this then that” rule-based coding scheme. Not all individuals provided job-family information.

Table 2: The 10 Job families within the analysis sample

Category	Job Families			
	Count	Cumulative Count	Percent	Cumulative Percent
Human Resources	3607	3607	7.10	7.10
Technical / Engineering / Research	6826	10433	13.44	20.55
Accounting / Finance	13989	24422	27.55	48.10
Administration / Operations	8277	32699	16.30	64.40
Marketing / Sales / Service	5488	38187	10.81	75.21
Management	9518	47705	18.75	93.95
Manufacturing / Construction	1024	48729	2.02	95.97
Teaching / Training	836	49565	1.65	97.62
Distribution	429	49994	0.84	98.46
Creative / Media	781	50775	1.54	100.00

In terms of age, these data used the “age at time of testing” (in years), grouped into five age-groups.

Table 3: The frequencies of cases in each of 5 age groups

Category	Frequency table: Age Group (yrs) (CPP dataset, n=60,572 cases)			
	Count	Cumulative Count	Percent	Cumulative Percent
20-29	14318	14318	24.46	24.46
30-39	24769	39087	42.31	66.77
40-49	14728	53815	25.16	91.93
50-59	4418	58233	7.55	99.48
60 and above	304	58537	0.52	100.00

Table 4: Gender frequencies for each age-group

Summary Frequency Table: Gender x Age-Group composition Marked cells have counts > 10				
	Age Group (yrs)	Gender M	Gender F	Row Totals
Count	20-29	6962	7356	14318
Row Percent		48.62%	51.38%	
Count	30-39	13419	11350	24769
Row Percent		54.18%	45.82%	
Count	40-49	9130	5597	14727
Row Percent		61.99%	38.01%	
Count	50-59	3063	1355	4418
Row Percent		69.33%	30.67%	
Count	60 and above	237	67	304
Row Percent		77.96%	22.04%	
Count	All Grps	32811	25725	58536

Not all cases provided a date of birth, from which their age at time of testing could be computed. For the purposes of the current analyses, age groups 50-59 and 60 and above were combined into the 50 years and above group.

Initially, the median ranks for the 14 styles were plotted for all 10 job families for each of the 4 age groups. Figures 1-4 show the results (using spline curves between each data point).

3. Results for single degree cases

Figure 1: Median ranked styles x job family for cases with a degree qualification, and aged between 20-29yrs.

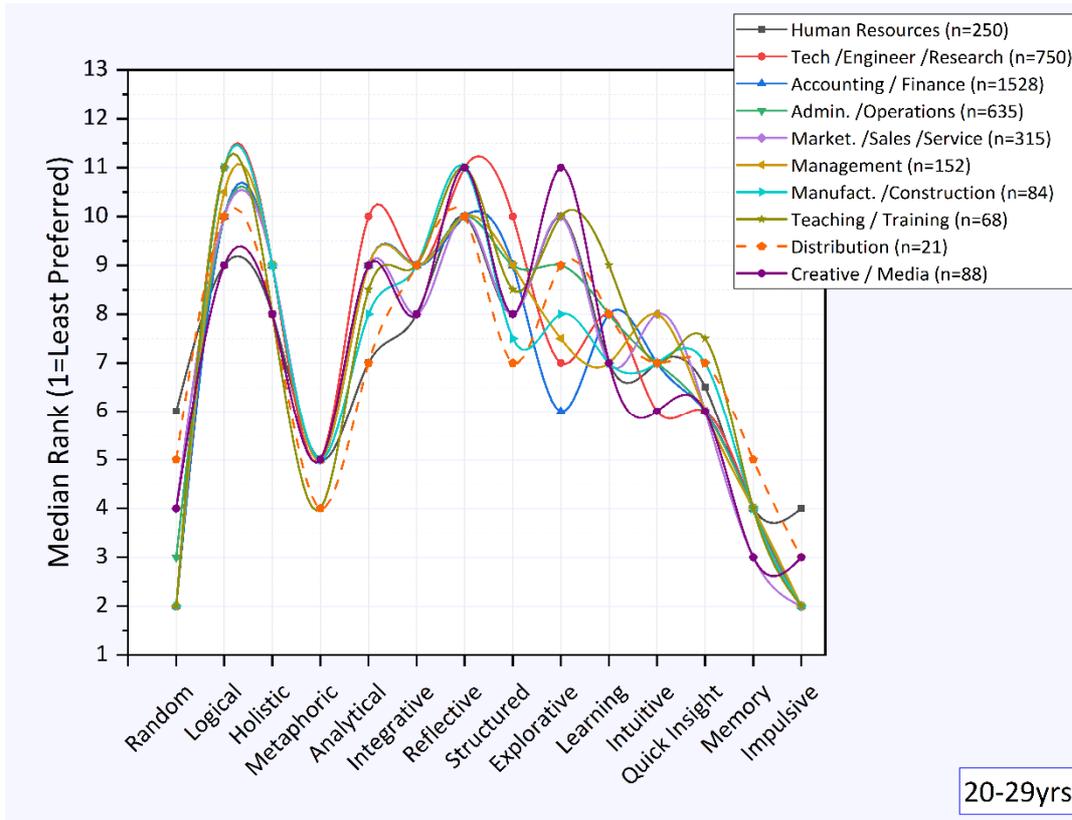


Figure 2: Median ranked styles x job family for cases with a degree qualification, and aged between 30-39yrs.

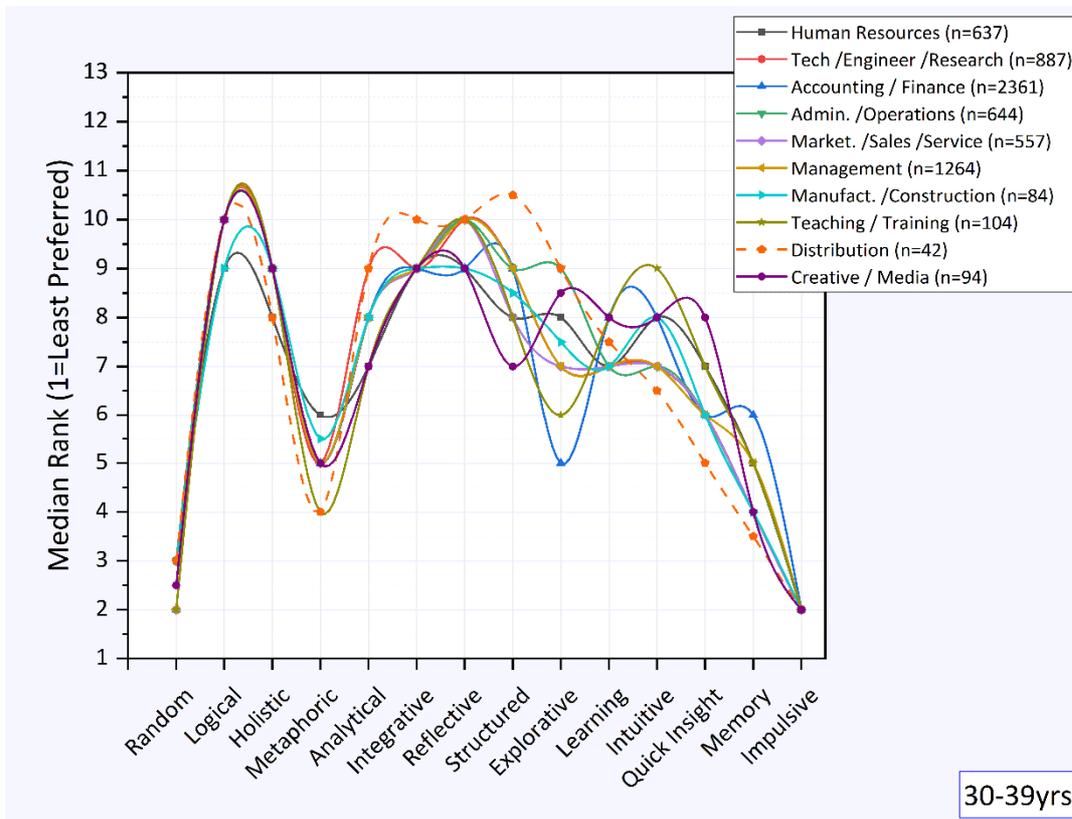


Figure 3: Median ranked styles x job family for cases with a degree qualification, and aged between 40-49yrs.

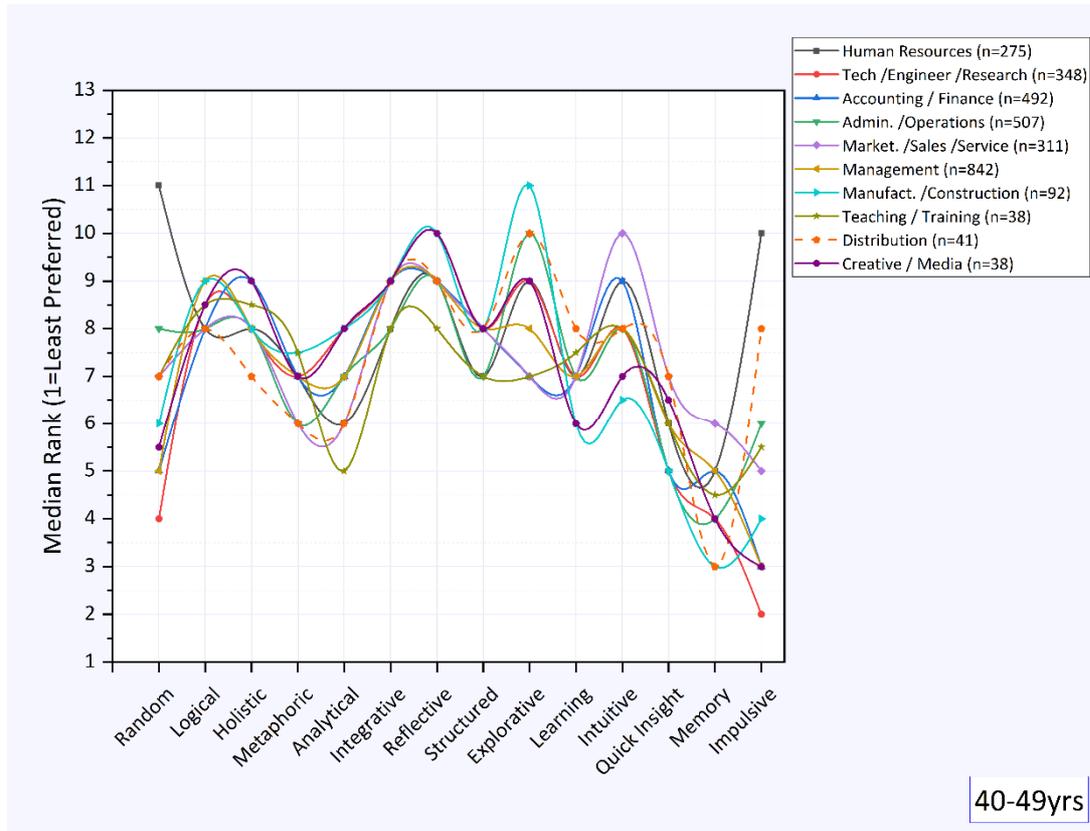
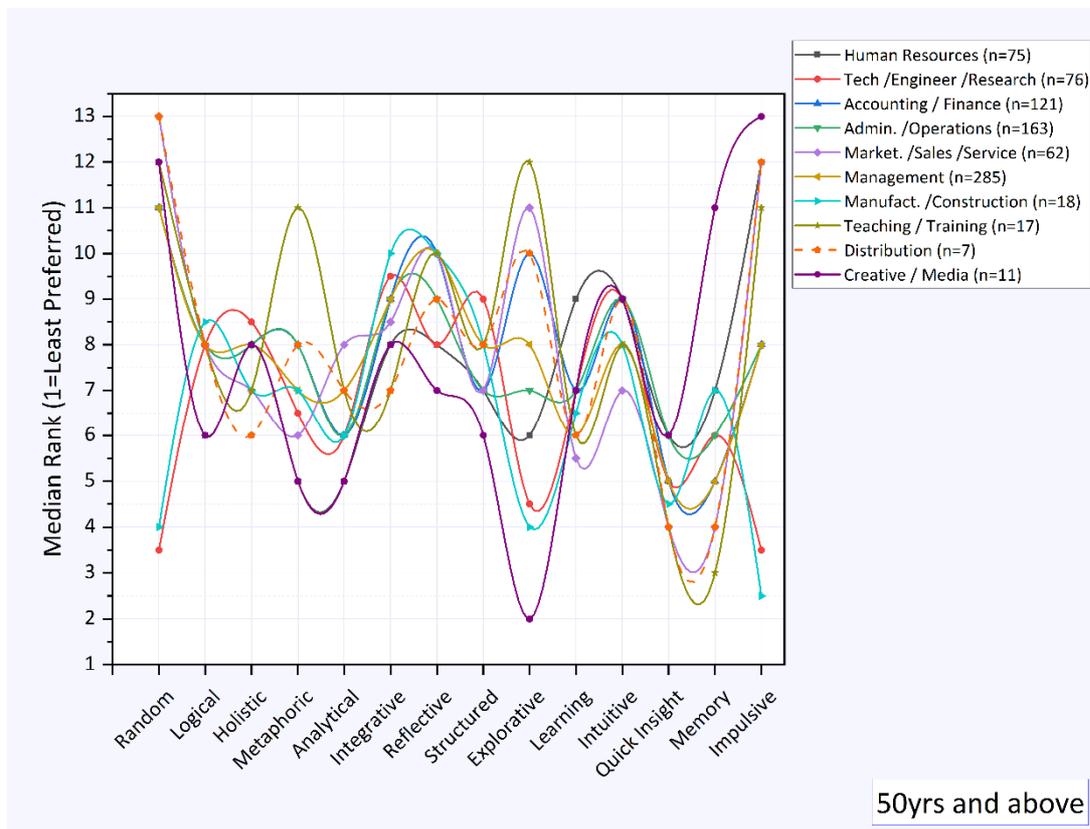


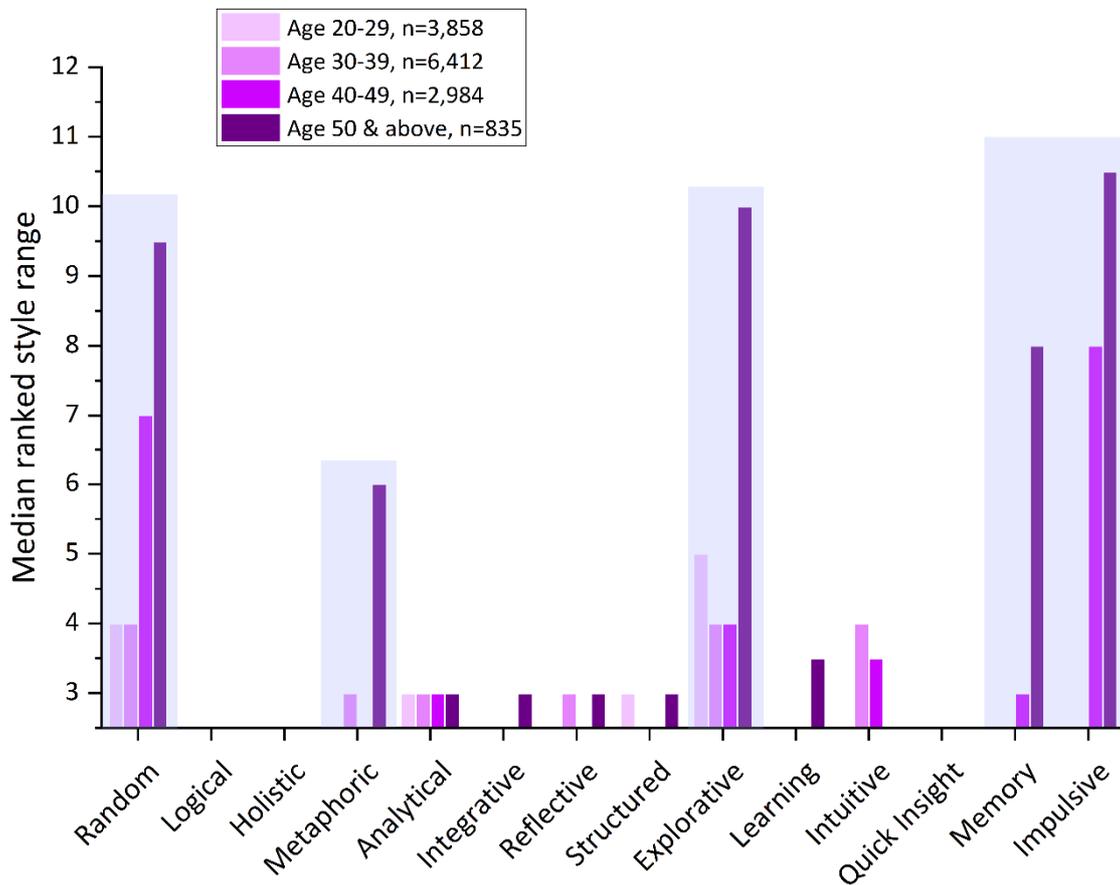
Figure 4: Median ranked styles x job family for cases with a degree qualification, and aged 50yrs and above.



Some style medians vary substantively across job family and age group, others barely at all. Rather than try to make sense of four such graphs visually, a more prudent way of encapsulating the trends is to computationally identify the substantively varying medians across both job families and age groups.

If we accept that a difference in rank-ordered style between functional areas is 'important' when ranks differ by 3 or more rank positions in the 1-14 ranking scheme, then we can compute the range of ranks across all 10 functional areas for each style separately, and assign a coded value of 0 if the range is less than 3, and assign the actual range if 3 or larger. We do this for every age-group, and construct a dataset containing the coded range for each style and for each of our 4 age groups. We can plot these coded ranges to show which ranked preferred cognitive styles are showing the most substantive variability across ages and functional areas.

Figure 5: The ranges of median ranks across 10 job families within four age groups, single degree cases



The five ranked styles showing most changes in median preferred ranked style across ages highlighted by the shaded areas:

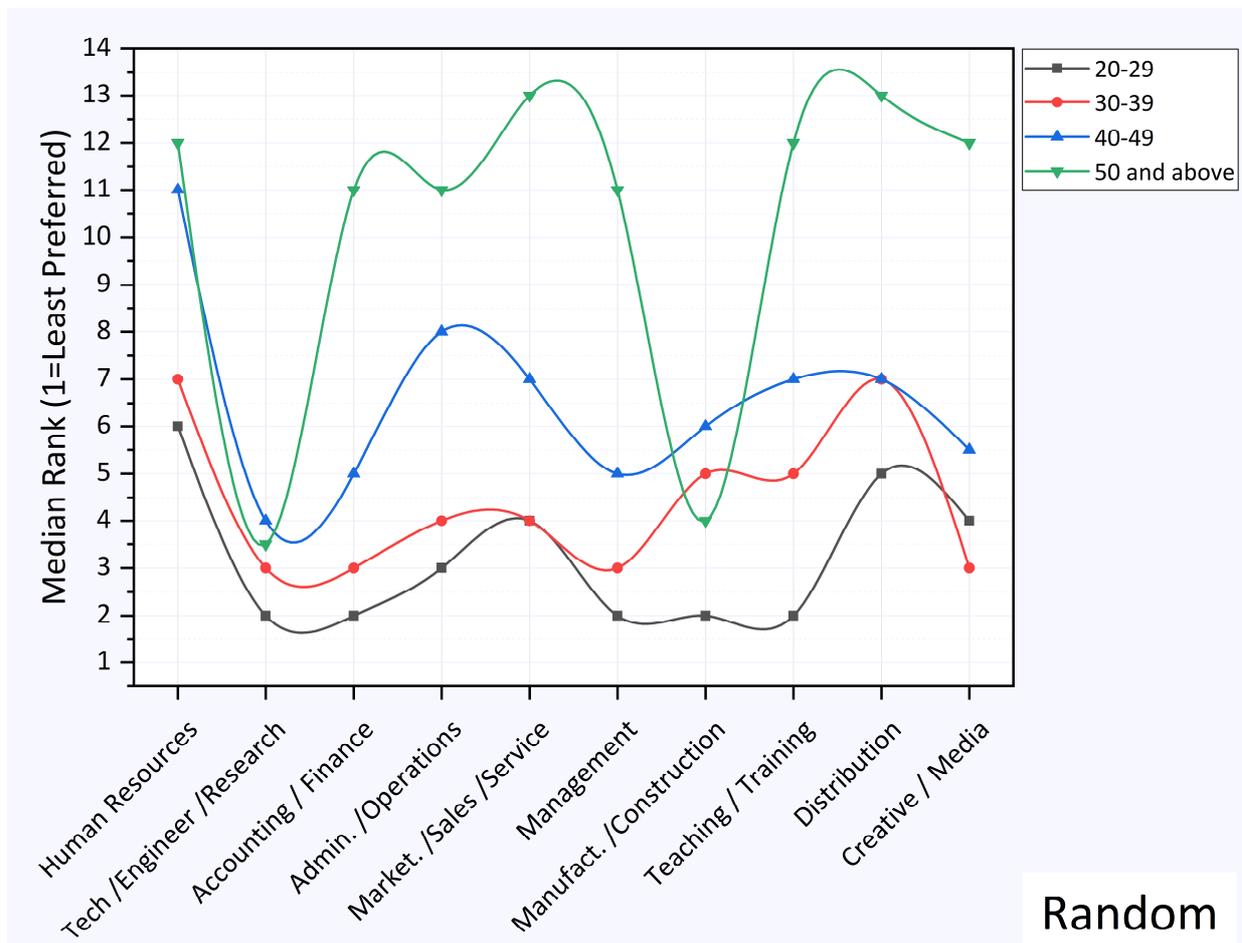
[Random](#), [Metaphoric](#), [Explorative](#), [Memory](#), and [Impulsive](#).

We can now look in detail at each of these substantively varying ranked styles.

Table 5: The numbers of cases for single degree cases x 10 job families x 4 age-groups

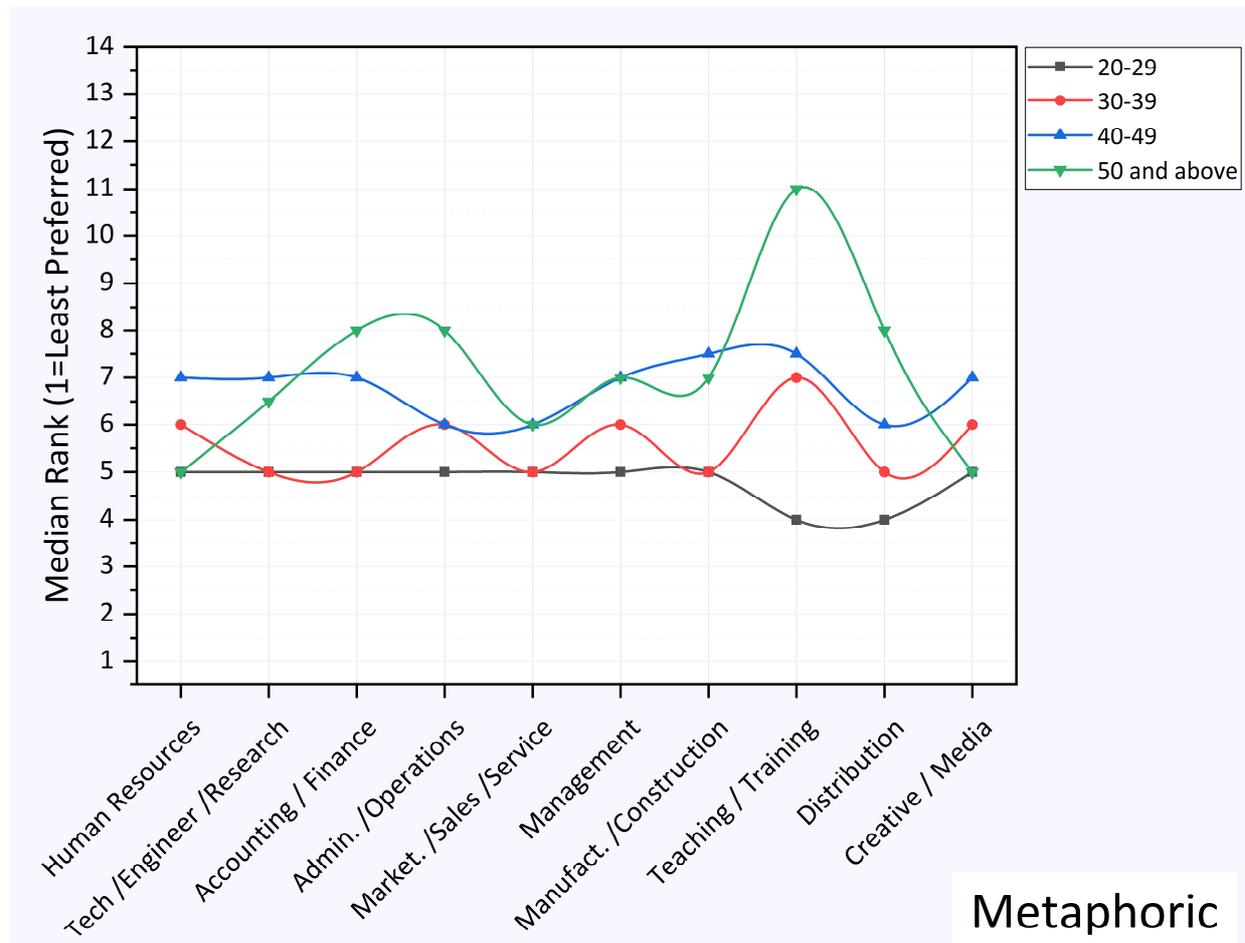
	# cases in each job family and age-group, single degree cases			
	1 20-29	2 30-39	3 40-49	4 50 & above
Human Resources	250	467	275	75
Tech /Engineer /Research	750	1387	348	76
Accounting / Finance	1528	1453	492	121
Admin. /Operations	635	955	507	163
Market. /Sales /Service	315	719	311	62
Management	152	1013	842	285
Manufact. /Construction	84	186	92	18
Teaching / Training	68	55	38	17
Distribution	21	74	41	7
Creative / Media	55	103	38	11

Figure 6: The Random preferred cognitive style rank across job family and age group



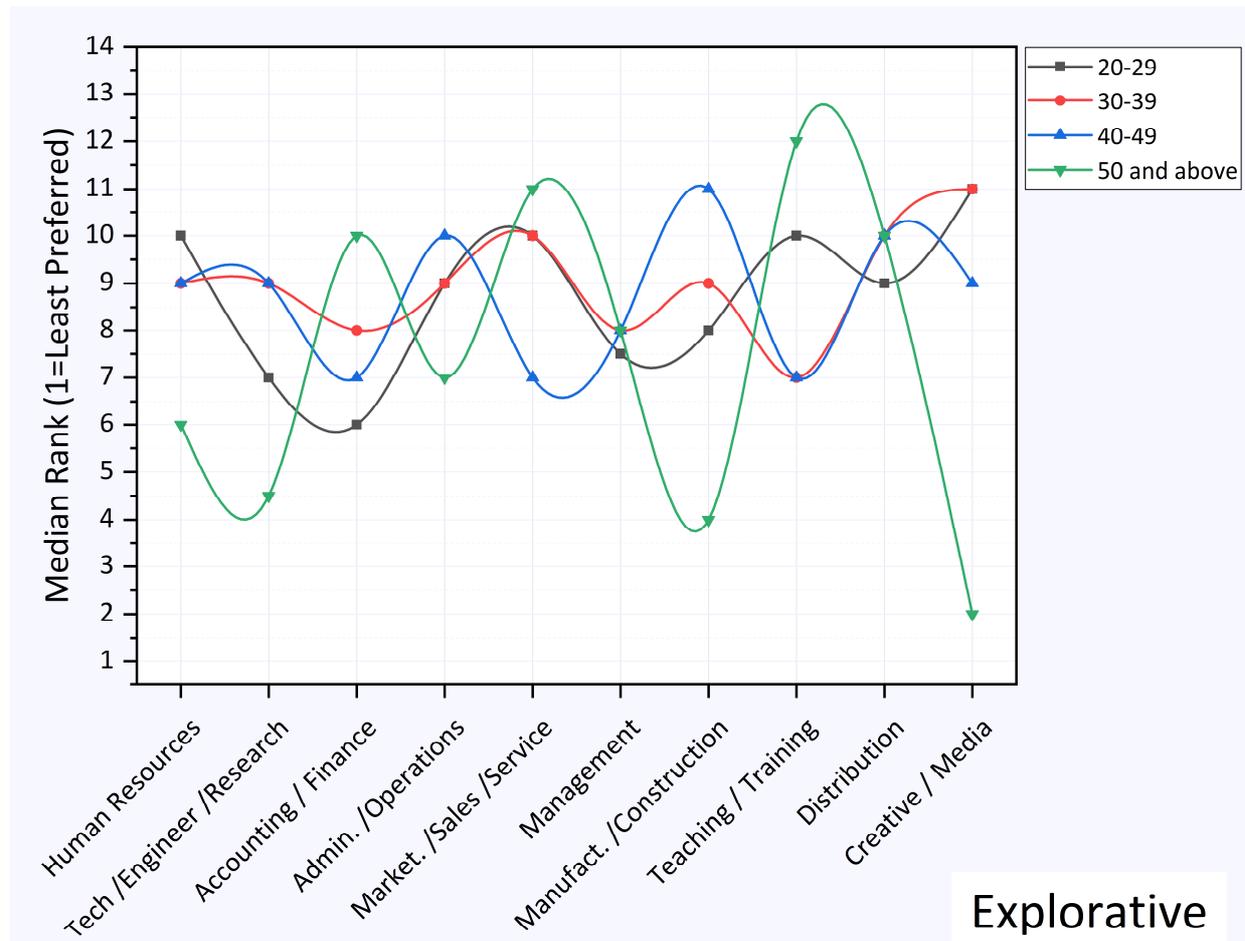
The trend here is that for all job families except Technical-Engineering-Research and Manufacturing-Construction, as individuals age, so do they show a preference for a less systematic/rigorous approach to working with information rather than systematically analysing, structuring or reasoning about issues.

Figure 7: The Metaphoric preferred cognitive style rank across job family and age group



There is less variability with age for this style, except for the older group of Teachers/Trainees who show an increasing preference for capitalising on auditive modes of processing and viewing cognitive challenges from abstract, creative and/or symbolic angles. As individuals in this particular job family age, it seems their preference for conveying information and aligning the perceptions of others is increasingly achieved by adopting the use of powerful metaphors. However, we must be cautious in our interpretation here as the sample size for this specific job family 50-and-above age group is just 17 cases.

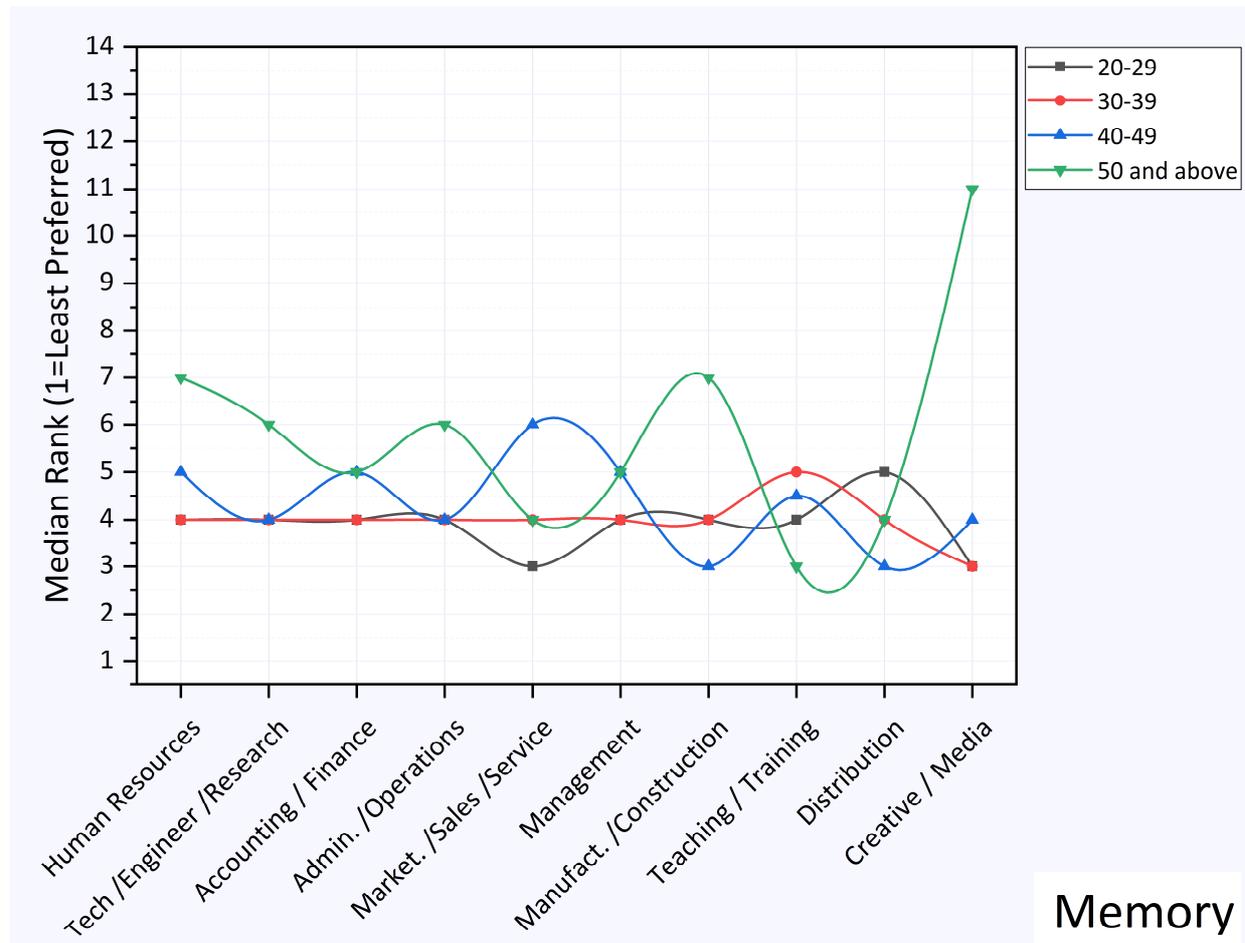
Figure 8: The Explorative preferred cognitive style rank across job family and age group



An explorative style is preferred by someone who thoroughly investigates different types of information but may get confused by over-exploring and checking too much, resulting in repeatedly revisiting the same information without moving forward. Again, we should be cautious here in over-interpreting the 50-and-above age group data as sample sizes for Manufacturing-Construction and Creative-Media groups are 18, and 11 respectively. However, for the Technical-Engineering-Research group, the sample size is 76. On balance, there are few systematic age-related general trends for this style.

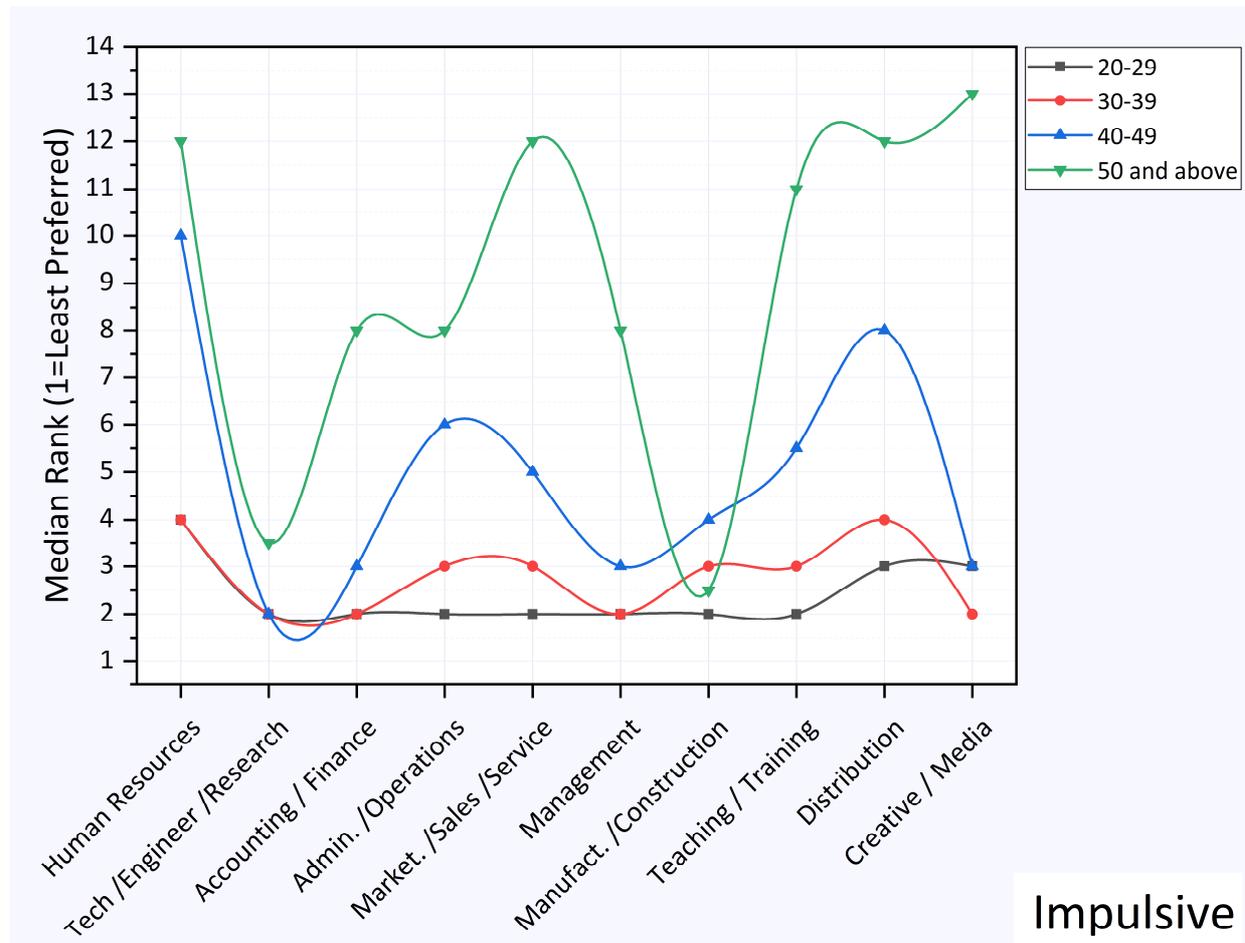
Interesting hypotheses can, however, be inferred here, for example that older individuals in creative and technical career fields may rely more on previous experience and personal insights than on exploring unfamiliar external sources of information. The 20 – 29-year-old accountants, of whom many are trainees or interns, may not explore additional and unfamiliar sources of information as widely as their older counterparts in accounting do. The most explorative in the 50 – 59-year age group seem to be those in accounting, marketing and teaching; in the 40 – 49-year age group, those in manufacturing; in the 30 – 39-year age group those in creative and marketing careers; and the 20 – 29-year age group those in human resources, teaching and marketing. For most age groups the more creative career fields are thus associated with an explorative approach whereas for those in the construction or manufacturing fields, characterised by practical risks, exploration is as important.

Figure 9: The Memory preferred cognitive style rank across job family and age group



The two most obvious changes in style preference with age are within the Human Resources group (n=75) and Creative-Media group (n=11), with the aged 50 and above group showing an increased preference for using memory strategies to process information/formulate solutions. A preference for a memory style of working within an individual is exemplified by a reliance on past experience and a knowledge base, internalisation and integration of information while processing it, and a tendency to use memory strategies such as confirmation of hypotheses, external reminders, visualisations and associations. As we grow older, experience is embedded in our memories, and we tend to employ more of that stored information resource in our decision-making.

Figure 10: The Impulsive preferred cognitive style rank across job family and age group

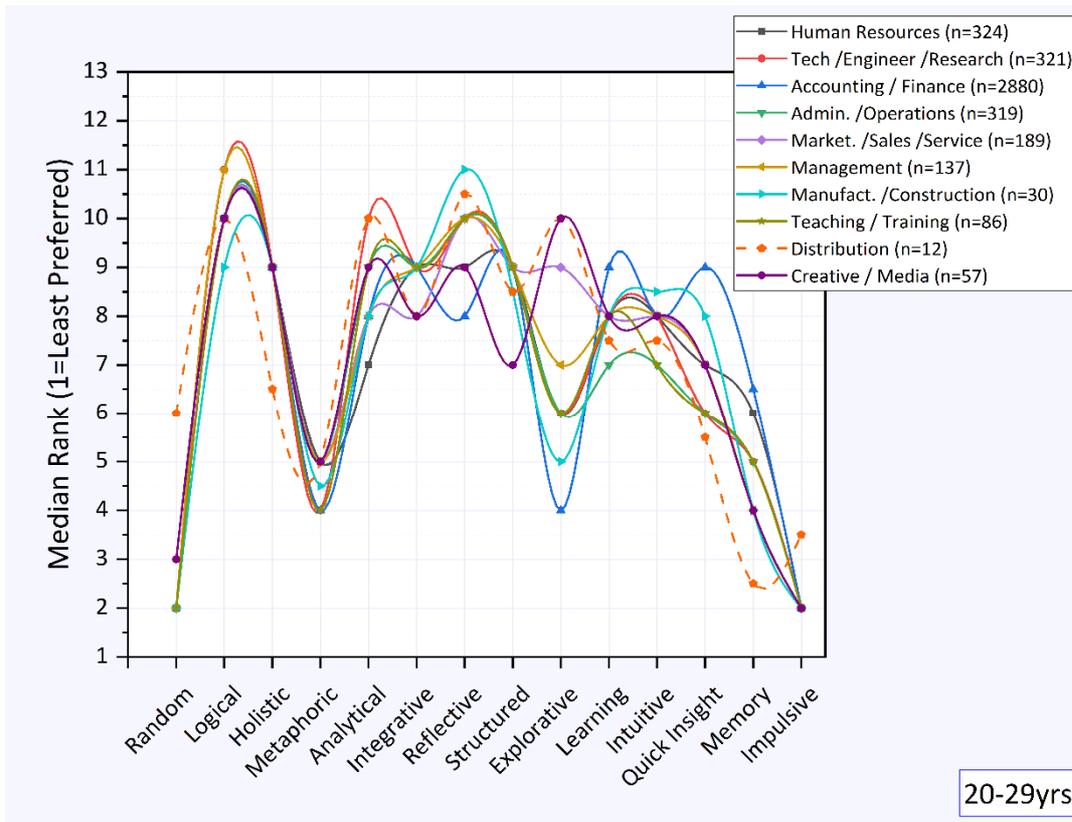


Similar in some respects to the data in Figure 6, for the Random style. Older age groups within certain job families show an increasing preference for an impulsive or reactive cognitive style. An individual showing a preference for this style of cognition may respond to problems emotionally rather than rationally, favouring quick solutions over taking longer but being more accurate. An element of impatience is associated with this stylistic preference.

Others may observe that the impulsive individual may not spend sufficient time on complex cognitive challenges, preferring instead to make quick decisions under conditions of uncertainty. The two job families where the least median preference is shown over all ages are the Technical-Engineering-Research and Manufacturing-Construction groups. This tendency may be related to the risk associated with judgement errors in these career fields.

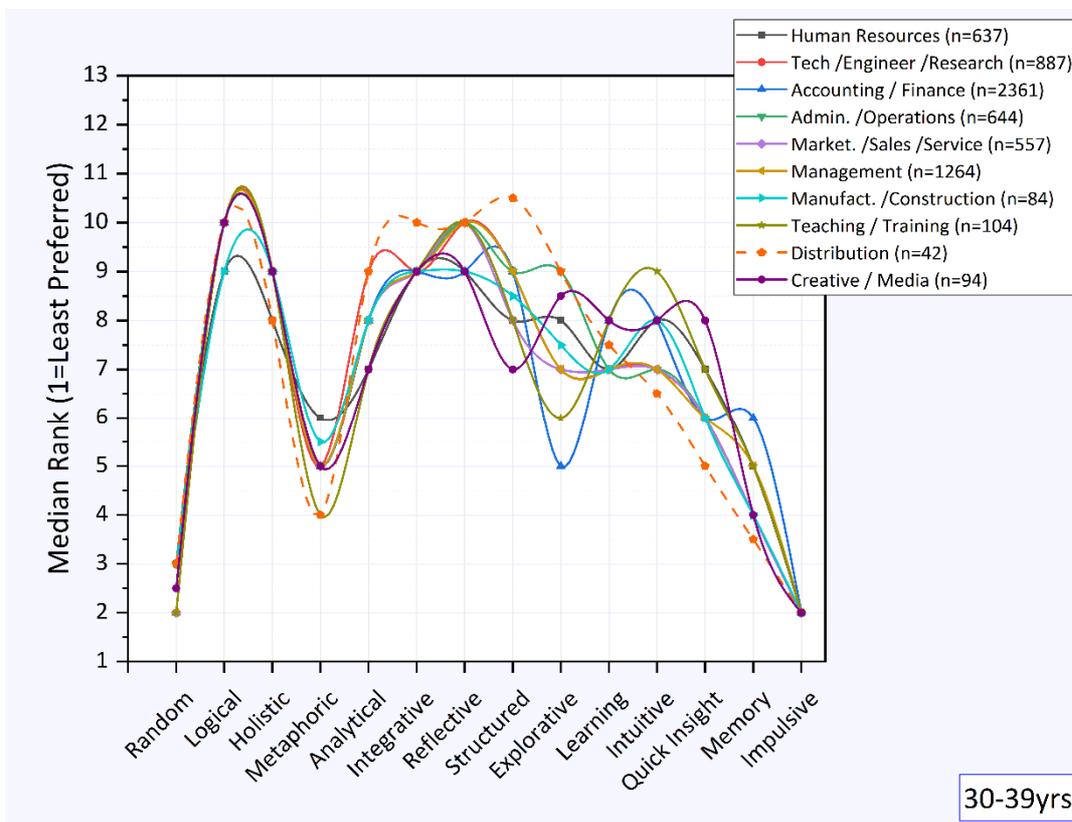
4. Results for multiple/postgraduate degree cases

Figure 11: Median ranked styles x job family for cases with multiple degree qualifications, aged between 20-29yrs.



20-29yrs

Figure 12: Median ranked styles x job family for cases with multiple degree qualifications, aged between 30-39yrs.



30-39yrs

Figure 13: Median ranked styles x job family for cases with multiple degree qualifications, aged between 40-49yrs.

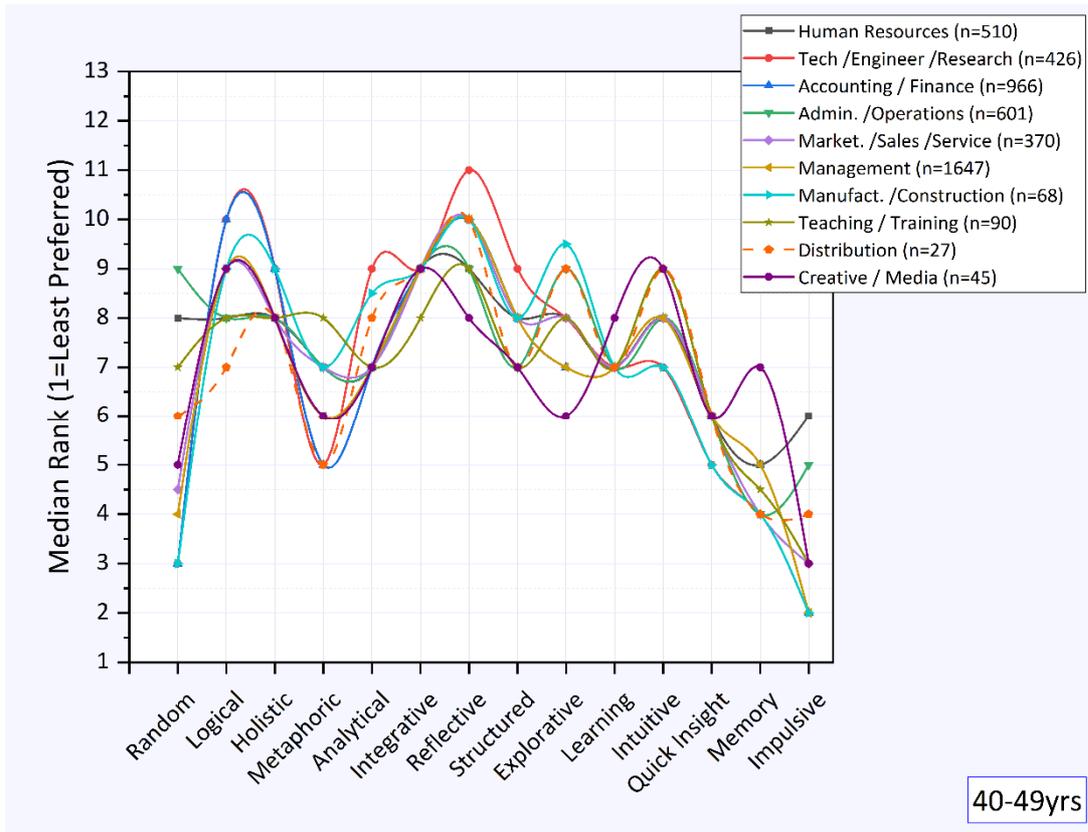
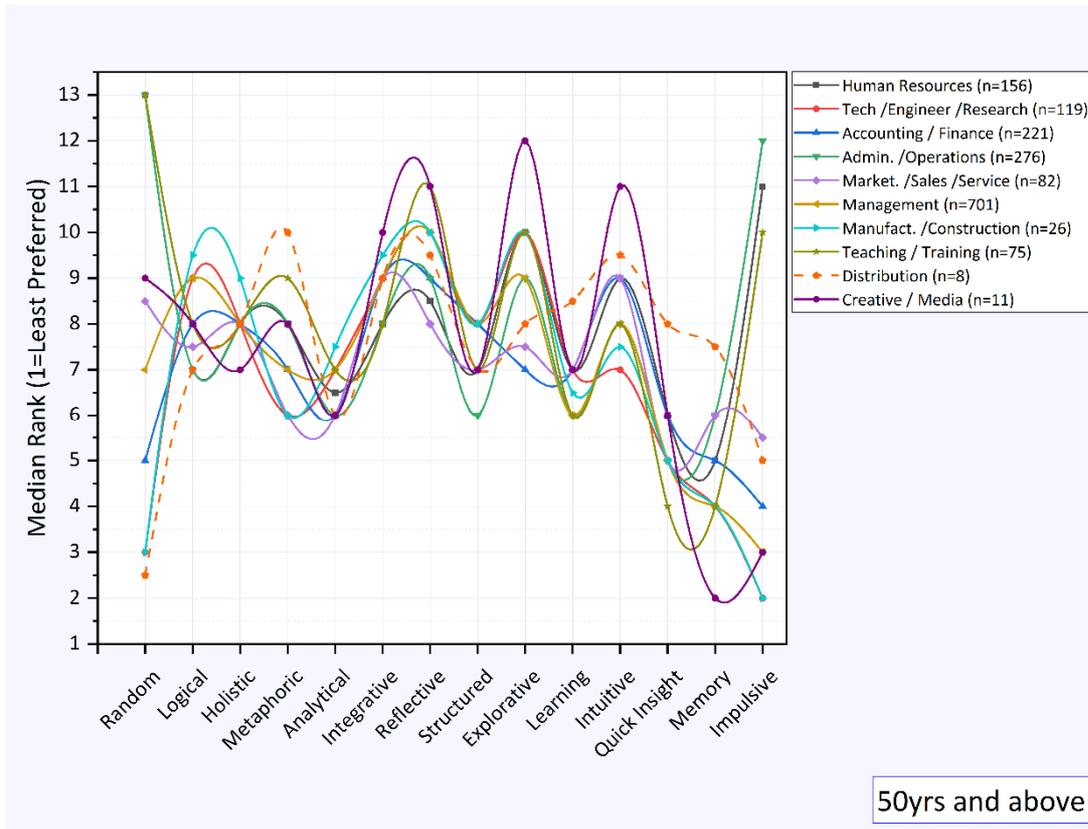


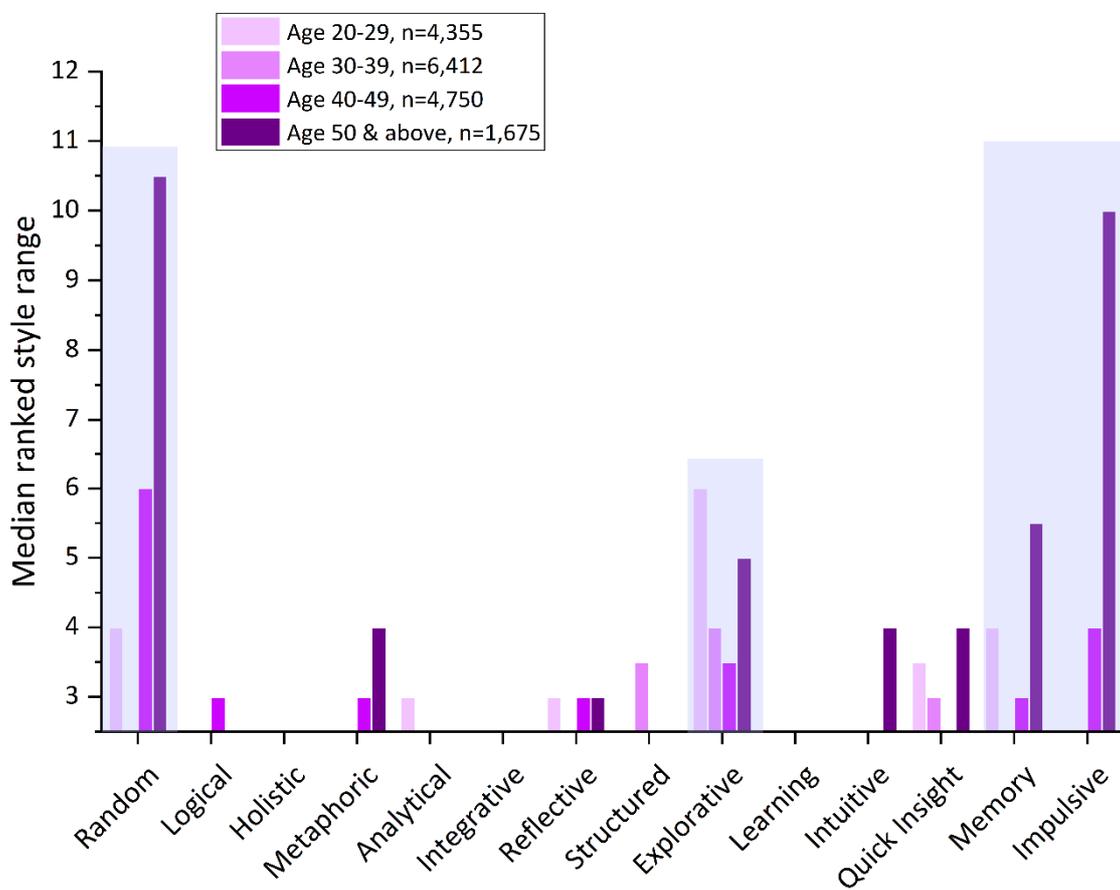
Figure 14: Median ranked styles x job family for cases with multiple degree qualifications, aged 50yrs and above.



As for the single-degree cases, rather than try to make sense of four such graphs visually, a more prudent way of encapsulating the trends is to computationally identify the substantively varying medians across both job families and age groups.

If we accept that a difference in rank-ordered style between functional areas is ‘important’ when ranks differ by 3 or more rank positions in the 1-14 ranking scheme, then we can compute the range of ranks across all 10 functional areas for each style separately, and assign a coded value of 0 if the range is less than 3, and assign the actual range if 3 or larger. We do this for every age-group, and construct a dataset containing the coded range for each style and for each of our 4 age groups. We can plot these coded ranges to show which ranked preferred cognitive styles are showing the most substantive variability across ages and functional areas.

Figure 15: The ranges of median ranks across 10 job families within four age groups, multiple degree cases



Similar to the single-degree cases, four ranked styles show the most changes in median preferred ranked style across ages, highlighted by the shaded areas (Metaphoric showed less change for the multiple-degree cases):

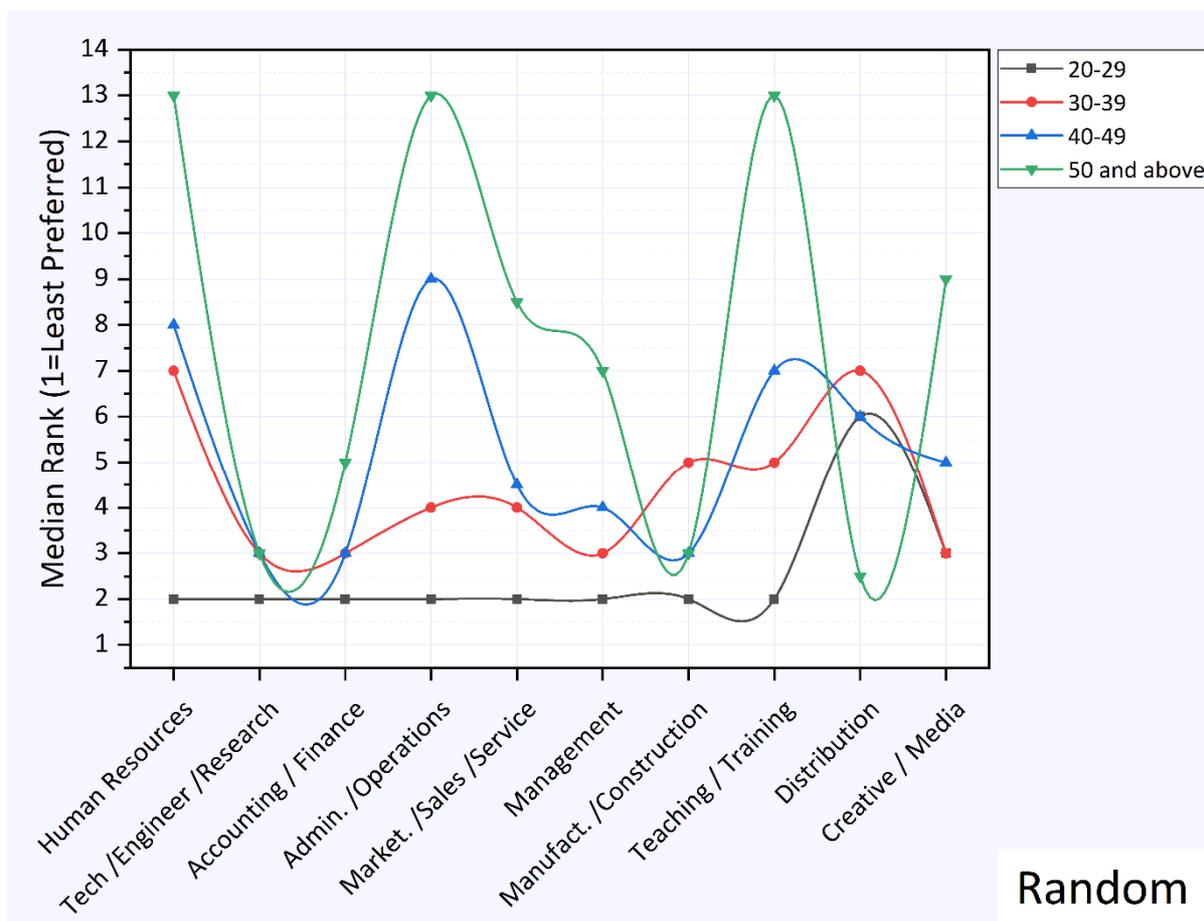
[Random, Explorative, Memory, and Impulsive.](#)

We can now look in detail at each of these substantively varying ranked styles.

Table 6: The numbers of cases for multiple degree cases x 10 job families x 4 age-groups

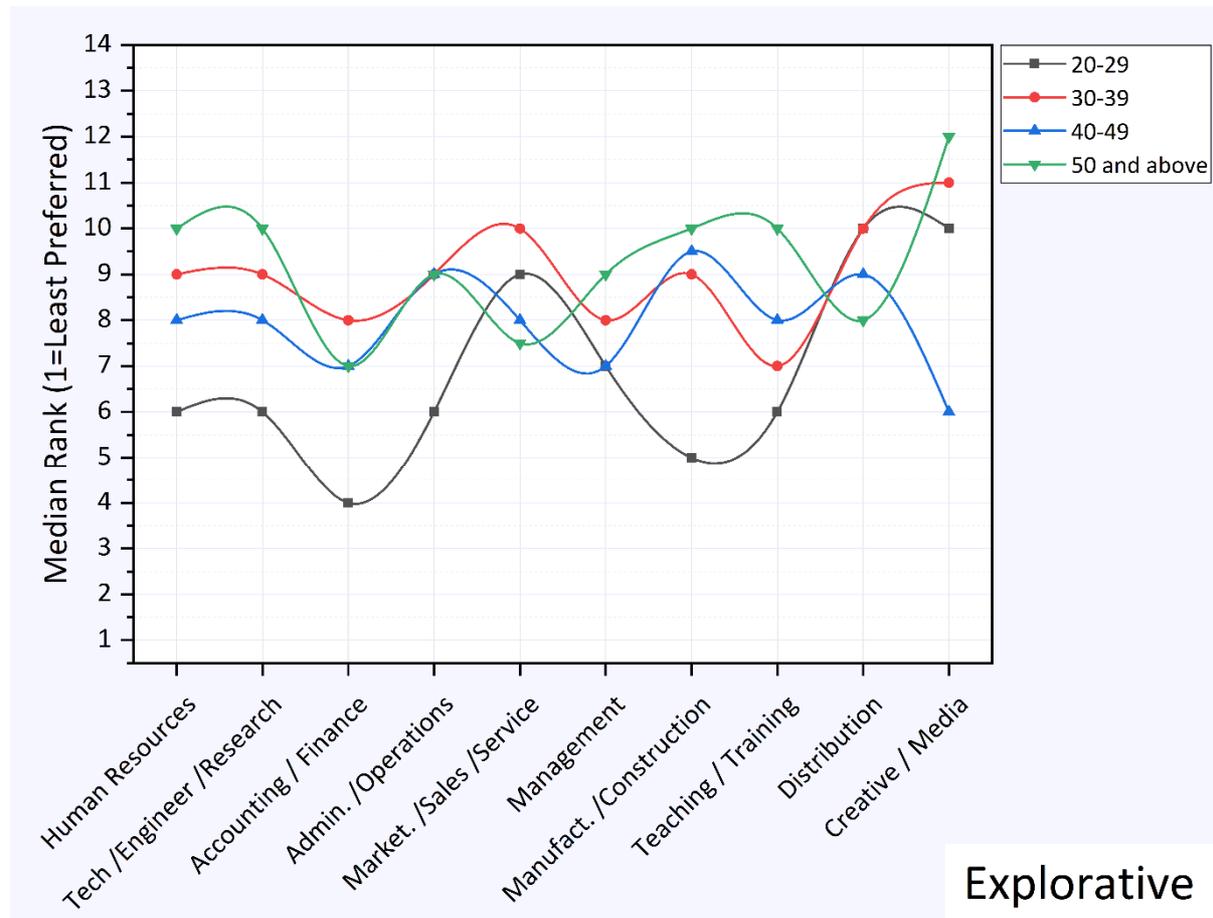
	# cases in each job family and age-group, multiple degree cases			
	1 20-29	2 30-39	3 40-49	4 50 & above
Human Resources	324	467	510	156
Tech /Engineer /Research	321	1387	426	119
Accounting / Finance	2880	1453	966	221
Admin. /Operations	319	955	601	276
Market. /Sales /Service	189	719	370	82
Management	137	1013	1647	701
Manufact. /Construction	30	186	68	26
Teaching / Training	86	55	90	75
Distribution	12	74	27	8
Creative / Media	57	103	45	11

Figure 16: The Random preferred cognitive style rank across job family and age group, multiple degree cases



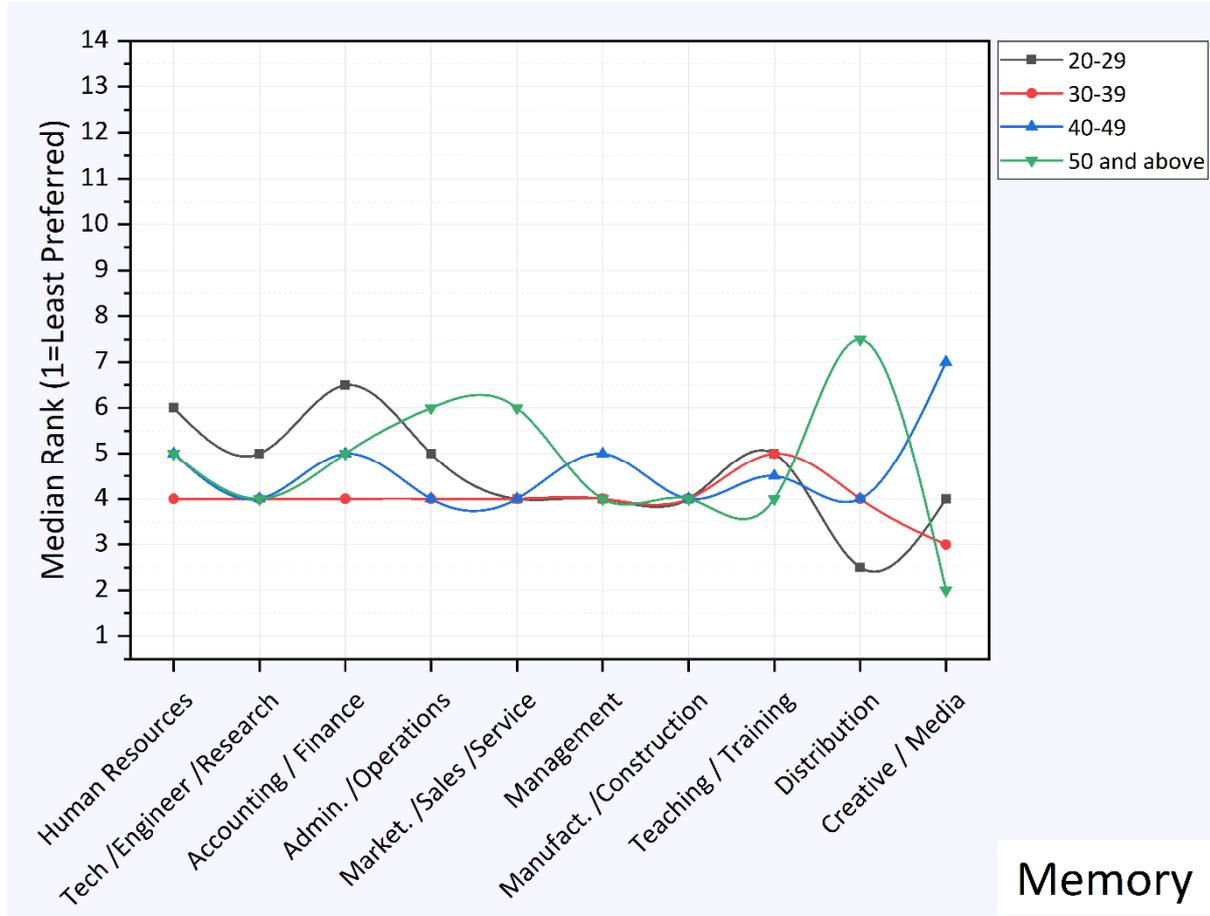
As in Figure 10 for single-degree cases, the trend here is that for all job families except Technical-Engineering-Research and Manufacturing-Construction, as individuals age, so do they show a preference for a less systematic/rigorous approach to working with information rather than systematically analysing, structuring or reasoning about issues. However, the older 50 and above age group show less preference for this style in the Distribution and Creative / Media groups than those in the single-degree cases. The key job families in the multiple-degree cases who show a substantive age-related trend toward preferring a random style of working with information are [Human Resources](#), [Administration / Operations](#), and [Teachers / Training](#).

Figure 17: The Explorative preferred cognitive style rank across job family and age group, multiple degree cases



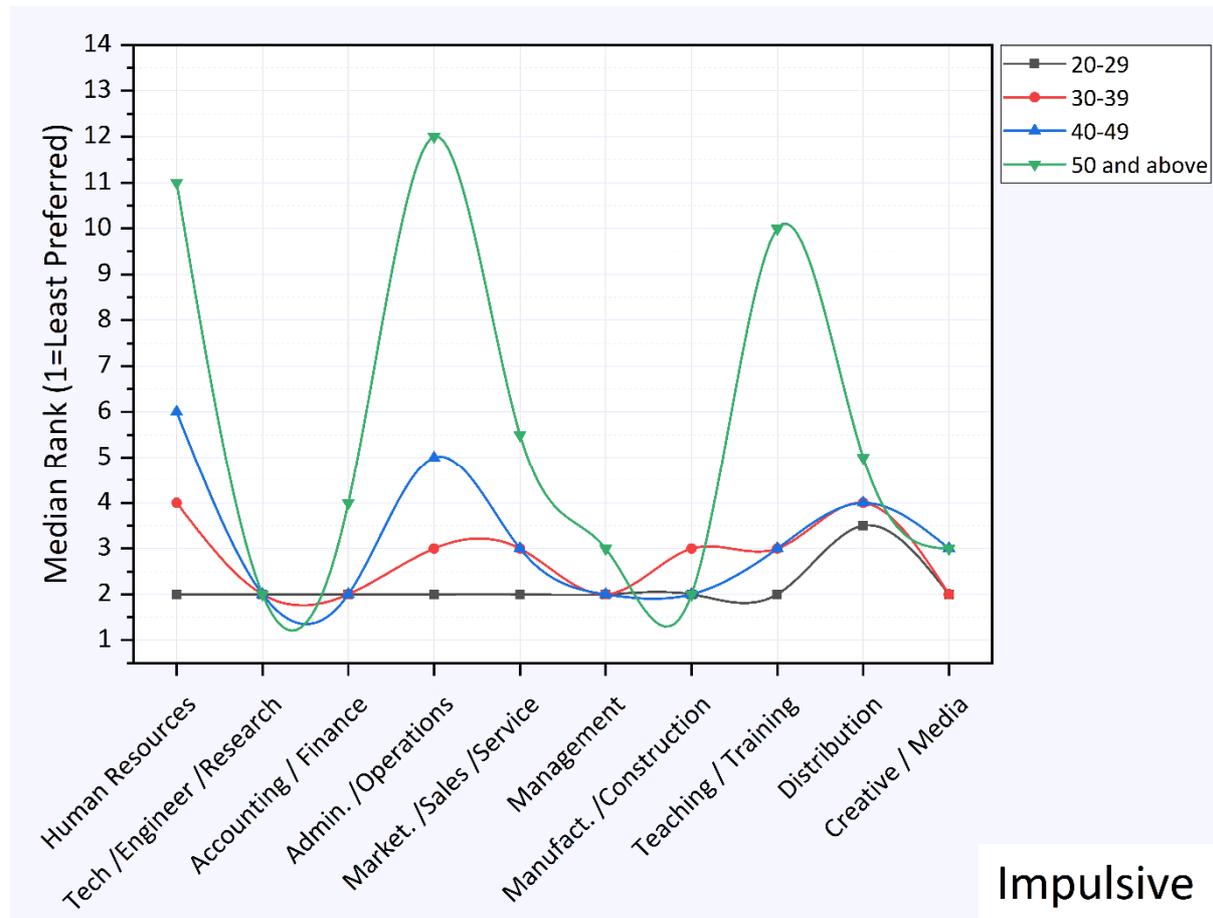
Perhaps the most significant effect here is that the younger 20-29 year age-group show much less preference for an Explorative style of thinking than the remaining older-aged groups in all job families except for Marketing / Sales / Service and Management. That may reflect a mindset/ job-demands for early career employees being assessed with the CPP, who are still learning from experience in their various roles, and so show less preference for being ‘explorative’ with information. The older aged groups are somewhat more homogenous in their rankings than for the single-degree cases shown in Figure 8.

Figure 18: The Memory preferred cognitive style rank across job family and age group, multiple degree cases



Similar in many respects to the single-degree data presented in Figure 9, except for the Distribution and Creative / Media job families. But with only 8 and 11 cases respectively in the Distribution and Creative / Media job families, these results are tentative at best.

Figure 19: The Impulsive preferred cognitive style rank across job family and age group, multiple degree cases



The 'standout' differences here between age-groups are with the older-aged group, 50 years and above, who show dramatically more preference for an Impulsive style of working with information, within several specific job families i.e. Human Resources, Administration / Operations, and Teaching / Training. These trends differ in part from those for single-degree cases (Figure 10) but the two job families where the least median preference is shown over all ages are the Technical-Engineering-Research and Manufacturing-Construction groups. This tendency may be related to the risk associated with judgement errors in these career fields.