REPORT OF APS EMPLOYEE SURVEY

2014- 2016

November 2021
Team project

TEAM INTRODUCTION

Ayushi Singh

3 years of work experience in SQL programming and support and automation
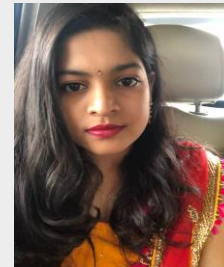
Mary Ann

10 years experience in Financial and Internal Audit

Priya Yadav

7 years of work experience in data analytics and data warehouse
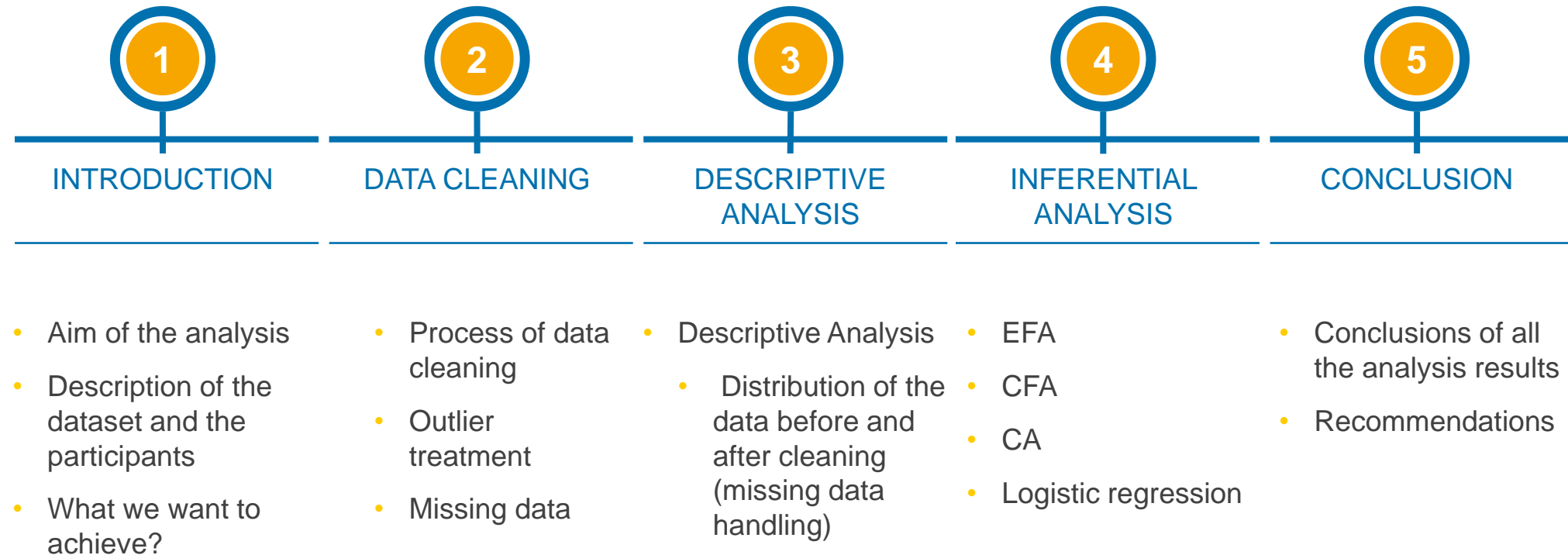
Sai Prasanna Gopularam

Masters in Computer Applications

Lien Pham

17 years of professional experience in data analytics, risk modelling & strategy consulting

THE REPORT CONSISTS OF 5 PARTS

1 INTRODUCTION

2 DATA CLEANING

3 DESCRIPTIVE ANALYSIS

4 INFERENTIAL ANALYSIS

5 CONCLUSION

- Aim of the analysis
- Description of the dataset and the participants
- What we want to achieve?

- Process of data cleaning
- Outlier treatment
- Missing data

- Descriptive Analysis
- Distribution of the data before and after cleaning (missing data handling)

- EFA
- CFA
- CA
- Logistic regression

- Conclusions of all the analysis results
- Recommendations

BACKGROUND AND PURPOSE OF THE SURVEY ANALYSIS

APS
- The Australia Public Service Census is a yearly survey used to collect opinions from the Australian Public Service employees regarding different areas of their workspaces. But mainly employee engagement and well-being

SURVEY QUESTIONS
- All respondents are asked a set of questions and the results are used for comparison and benchmark between years.
- These questions are reviewed and updated every year ensuring that all questions meet a required purpose

RESPONDENTS
- All employees of around 100 Public Service Agencies across all of Australia.
- The 2016 APS survey was taken by 96762 engineering professionals

APS GOALS 2016
- Focus on what leadership styles that can drive employee's innovation
- **Increase employee's satisfaction and productivity**

EXPECTATION OF THE ANALYSIS
- What leadership styles can be used to drive innovation
- Other factors that can have impact on employee's innovation
- Track the trend in employees' satisfaction and productivity from 2014 to 2016

METHODOLOGY

STATISTIC METHOD

EFA & CFA

- EFA is used to used **to explore the possible underlying factor** structure of a set of observed variables without imposing a preconceived structure on the outcome. The underlying factor structure is identified
- CFA is used to **verify the factor structure of a set of observed variables**. CFA allows us to **test the hypothesis** that a **relationship** between observed variables and their underlying latent constructs exists

Logistic regression

- LM is used to answer:
  - Leadership styles be used to **predict** employees that strive for **creativity and innovation**
  - If APS should **recruit supervisors** who have **transformation** and **consideration styles**

CA

- CA is an extension of principal component analysis suited to explore relationships among qualitative variables (or categorical data)
- Like principal component analysis, it provides a solution for summarizing and visualizing data set in two-dimension plots

QUESTIONS TO ASK?

Question 1 & 4:
- Characteristics of leadership styles
- Impact of leadership styles

Question 2 and 3
- Leadership can predict innovation

Question 5,6,7:
- Male & female perception about workgroup and supervisor
- Wellbeing and productivity from 2014 to 2016

FACTORS THAT DRIVE EMPLOYEE'S INNOVATION
LEADERSHIP IS ONLY ONE FACTOR

FOCUSED AREA

LEADERSHIP

- Consideration leadership style
- Transformational
- Democratic
- Autocratic

Innovation

L

S   C

M

JOB SATISFACTION

- Well-being
- Monetary
- Non – monetary
- Work – life balance
- Recognition
- Performance

AGENCY'S CULTURE

- Agency encourage innovation
- Encourage different ways of working

WORKPLACE' MOBILITY

- Secondments
- Temporary transfer
- Work from anywhere
- Flexible working hours

QUOTES OF SOME LEADERSHIP STYLES

"
Transformational leaders have a deep understanding of the fundamental values in our society and of people's social and emotional needs. They are curious, explorative and have broad interests. They have a learning attitude, self-awareness, and knowledge of their strengths and weaknesses
"

"
Considerate leadership is a particular characterization of leader behavior that emphasizes commitment to developing personal relationships with followers, care and concern for others, **willingness to attend to the unique preferences and work styles of subordinates**, and facilitating cooperation among members of a wor"

"
Autocratic leaders make all the decisions themselves and don't trust anyone else to do so. The result is obvious – less motivated employees who are less likely to propose new ideas and suggestions in a 'the boss knows best' climate. When employees accept that they should do what someone else wants them to do, with no questions asked, then the results will be as expected
"

"
Democratic leaders act collaboratively and foster a culture of joint responsibility. Employees are likely to feel supported and encouraged to think big, but **with the safety net of being able to learn from others** and **not having to shoulder excessive responsibility or burden**
"

DATA CLEANING PROCESS

- Description:
  - Likert scale (ordinal variable)
  - Binary variable
  - Nominal variable

RAW DATASET

1. Code categorical variables to likert scale

2. Fill the missing values with mode values

Clean data

- **Missing data check**
  - 17 questions with > 60% of missing responses
  - Missing patterns found
  - questions (Q75 to Q78) – 98% missing
- **Outlier check**
  - Use the mahalanobis distance and data distribution and found no outliers in the data

- Likert scale:
  - Strongly agree → 1
  - Agree → 2
  - Neither agree nor disagree → 3
  - Disagree → 4
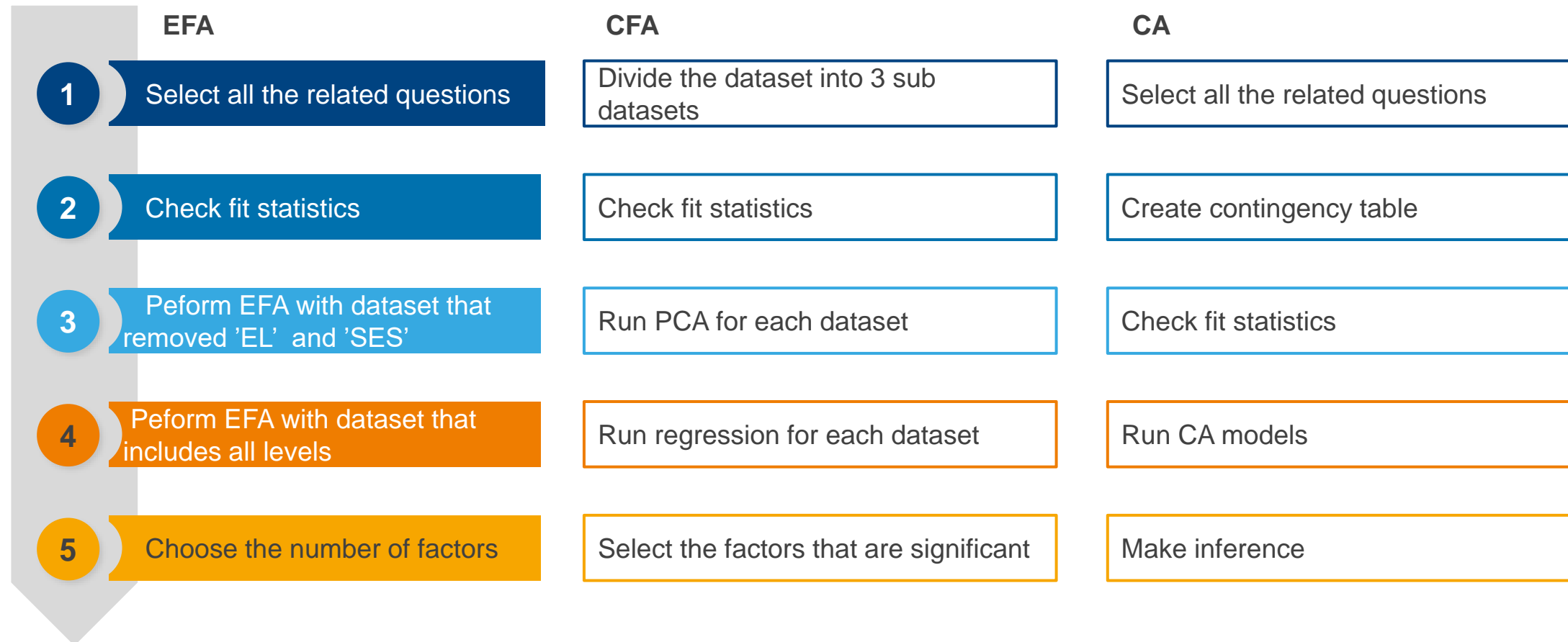 - Strongly disagree → 5

DESCRIPTIVE ANALYSIS

▸ **TO BE PRESENTED IN TABLEAU**

QUESTIONS SELECTION FOR EFA AND CFA ANALYSIS

	Leadership Style	Q.No.	Questions	mean	median	mode	std	min	max	kurtosis	skewness
2	transformational	q24g	In my agency, SES ensure that work effort contributes to the strategic direction of the agency and the APS	2.624701	2	2	0.991933	1	5	0.110707	0.636142
3	transformational	q24h	In my agency, SES effectively lead and manage organisational change	2.795899	3	2	1.072455	1	5	-0.4728	0.459801
4	transformational	q24j	In my agency, SES encourage innovation and creativity	2.757157	3	3	1.016668	1	5	-0.18966	0.413976
5	transformational	q25l	My agency motivates me to help achieve its objectives	2.669524	3	2	0.984712	1	5	-0.16289	0.547073
6	transformational	q25m	My agency inspires me to do the best in my job	2.689902	3	2	1.013221	1	5	-0.25477	0.485271
7	transformational	q25p	My workplace culture supports people to achieve a good work-life balance	2.448039	2	2	1.001622	1	5	0.252037	0.858866
8	transformational	q28e	Developing new ideas— Employees are encouraged to make suggestions	2.706244	3	3	0.966167	1	5	-0.08289	0.310093
9	transformational	q28g	People—Team cohesion is important	2.467853	2	2	0.927336	1	5	0.292989	0.586065
10	transformational	q28h	Achieving goals—Work must be completed to a high standard	2.091251	2	2	0.890484	1	5	0.954408	0.854979
11	transformational	q28m	Encourage innovation	2.865834	3	3	0.956499	1	5	-0.11139	0.18101
12	transformational	q64d	My supervisor openly demonstrates commitment to performance management	2.473787	2	2	0.945838	1	5	0.405486	0.794225
13	transformational	q71a	Achieves results	2.108031	2	2	0.882546	1	5	1.308795	1.003346
14	transformational	q71b	Cultivates productive working relationships	2.147973	2	2	0.974935	1	5	0.888743	1.013547
15	transformational	q71c	Exemplifies personal drive and integrity	2.070811	2	2	0.944386	1	5	1.156465	1.05534
16	transformational	q71d	Shapes strategic thinking	2.175839	2	2	0.959042	1	5	0.729746	0.903495
17	transformational	q71e	Communicates with influence	2.179979	2	2	0.991527	1	5	0.710455	0.965443
18	transformational	q71g	Motivates people	2.284881	2	2	1.022079	1	5	0.383908	0.845581
19	transformational	q71h	Encourages innovation	2.286467	2	2	0.992379	1	5	0.442725	0.813441
20	transformational	q71i	Develops people	2.276382	2	2	1.021234	1	5	0.441786	0.867883
21	transformational	q71j	Is open to continued selflearning	2.162626	2	2	0.936072	1	5	1.021234	0.937938
22	Considerational	q28n	Make sure procedure is rigorously followed	2.298627	2	2	0.876534	1	5	0.523585	0.583021
23	Considerational	q28f	Process—Employees are expected to follow established procedures	1.9494	2	2	0.783404	1	5	1.514931	0.871901
24	Considerational	q24k	In my agency, SES behave in an accepting manner towards people of diverse backgrounds	2.286519	2	2	0.837698	1	5	1.294192	0.763485
25	Considerational	q24l	In my agency, SES actively support opportunities for women in leadership roles	2.346015	2	2	0.891696	1	5	0.689915	0.602901
26	Considerational	q24m	In my agency, SES actively support the use of flexible work arrangements by men and women	2.506815	2	2	0.975643	1	5	0.347868	0.68812
27	Considerational	q23g	My supervisor treats people with respect	1.846051	2	2	0.861373	1	5	2.258473	1.308881
28	Considerational	q23d	My supervisor works effectively with people from diverse backgrounds	1.91754	2	2	0.80882	1	5	1.715204	0.993796
29	Considerational	q23f	My supervisor behaves in an accepting manner towards people from diverse backgrounds	1.821033	2	2	0.747428	1	5	2.34163	1.061145
30	Considerational	q25j	In general, employees in my agency feel they are valued for their contribution	2.759336	3	2	1.01924	1	5	-0.42587	0.524798
31	Considerational	q28o	Value their employees	2.712125	3	3	0.98531	1	5	-0.02307	0.376197
32	Considerational	q42a	SES act quickly to correct problems or issues that affect an employee's psychological health	2.903482	3	3	0.924276	1	5	0.317225	0.234262
33	Considerational	q42c	SES show support for stress prevention through involvement and commitment	2.940921	3	3	0.942602	1	5	0.089813	0.237952
34	Considerational	q42e	In my agency, SES clearly consider the psychological health of employees to be important	2.890123	3	3	0.969555	1	5	0.009084	0.285902
35	Considerational	q64c	My supervisor provides me with a clear understanding of how my performance is assessed and measured	2.53028	2	2	0.961422	1	5	0.114413	0.732625
36	Considerational	q79f	In my agency, people are expected to admit mistakes and learn from them	2.408514	2	2	0.905156	1	5	0.736948	0.853846
37	Others	q23i	My supervisor communicates effectively regarding the business risks that impact my workgroup	2.07444	2	2	0.977164	1	5	0.838615	1.010144
38	Others	q25e	Internal communication within my agency is effective	2.917738	3	2	1.086227	1	5	-0.7741	0.352738
39	Others	q25s	My agency is committed to creating a diverse workforce (e.g. gender, age, cultural and linguistic background	2.239621	2	2	0.826891	1	5	1.367321	0.85502
40	Others	q64e	My performance discussion helps me understand what is required of me and how this can be achieved	2.504719	2	2	0.943718	1	5	0.367962	0.825315
41	Others	q64f	My performance agreement provides me with meaningful and relevant information that enables me to per	2.673706	2	2	1.008055	1	5	-0.18637	0.645156
42	Others	q79c	When my immediate supervisor identifies a problem he or she takes responsibility for it	2.091721	2	2	0.824789	1	5	1.805412	1.051785
43	Others	q79d	When senior leaders in my agency identify a problem they take responsibility for it	2.566895	2	2	0.946328	1	5	0.202848	0.592561
44	Others	q24f	In my agency, SES communicate effectively regarding the business risks that we face	2.781299	3	2	1.034834	1	5	-0.37929	0.462432
45	Common for both	q79e	In my agency, people are encouraged to speak up when they identify a serious policy or delivery risk	2.399566	2	2	0.962163	1	5	0.571638	0.889979
46	Common for both	q24c	In my agency, communication between SES and other employees is effective	2.857022	3	2	1.064996	1	5	-0.5678	0.354676
47	Common for both	q24d	In my agency, SES engage with staff on how to respond to future challenges	2.815015	3	2	1.061804	1	5	-0.51881	0.406089
48	Common for both	q24e	In my agency, SES give their time to identify and develop talented people	3.063375	3	3	1.041851	1	5	-0.43989	0.139917
49	Common for both	q80c	Do senior leaders (i.e. the SES) in your agency act in accordance with the APS Values?	2.306271	2	1	1.669792	1	6	0.475403	1.324097
50	Common for both	q23h	My supervisor has the appropriate level of skills, abilities and knowledge to do their job	1.920856	2	2	0.956561	1	5	1.520764	1.245539
51	Common for both	q71f	Sets direction	2.18269	2	2	0.93814	1	5	0.911233	0.935167

Data mining to see what is this leadership style!

PROCEDURE OF INFERENTIAL STATISTICS METHODS

	EFA	CFA	CA
1	Select all the related questions	Divide the dataset into 3 sub datasets	Select all the related questions
2	Check fit statistics	Check fit statistics	Create contingency table
3	Peform EFA with dataset that removed 'EL' and 'SES'	Run PCA for each dataset	Check fit statistics
4	Peform EFA with dataset that includes all levels	Run regression for each dataset	Run CA models
5	Choose the number of factors	Select the factors that are significant	Make inference

CHECK FIT STATISTICS

BARTLETT'S TEST

▶ Factor analysis requires a certain level of correlation in order to function appropriately

▶ Chi-square describes the similarity of the observed and expected matrices

▶ Chi-square value is close to zero: **acceptable model fit**

KMO

▶ Kaiser-Meyer-Olkin factor adequacy

▶ Call: KMO(r = correlations)

▶ Overall MSA **= 0.98** > 0.5, that indicates **factor analysis is appropriate**.

THE COMPARATIVE FIT INDEX (CFI)

▶ CFI ranges from 0 to 1 with a larger value indicating better model fit. Acceptable model fit is indicated by **a CFI value of 0.90 or greater**

EFA MODEL 1
DATASET WITH ALL LEVELS OF 'SUBORDINATES','EL' & 'SES'

2 FACTORS – VARIMAX ROTATION

	Factor1	Factor2
SS loadings	15.710	13.635
Proportion Var	0.291	0.253
Cumulative Var	0.291	**0.543**
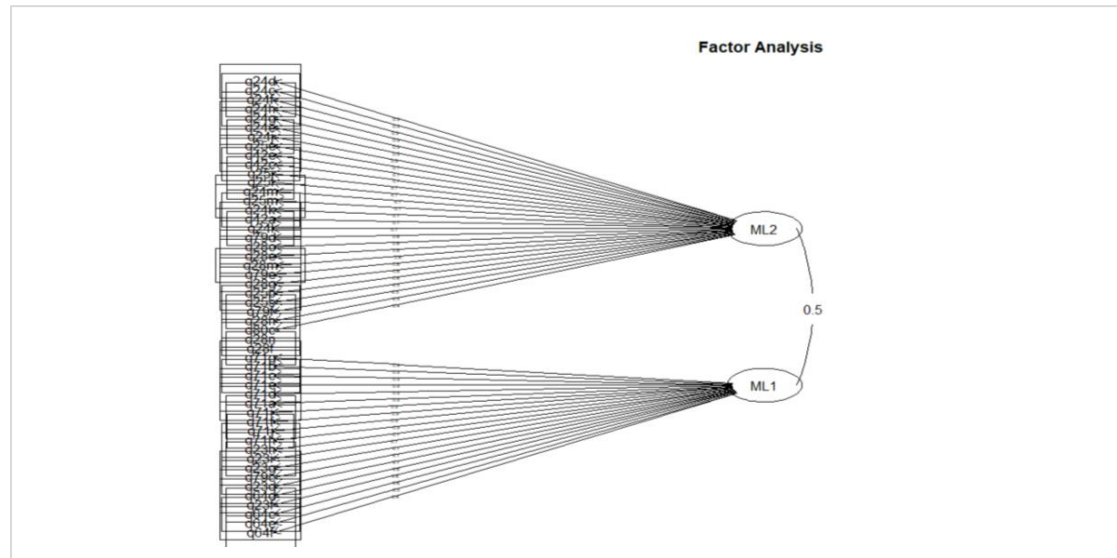
3 FACTORS – VARIMAX ROTATION

	Factor1	Factor2	Factor3
SS loadings	14.196	13.521	2.834
Proportion Var	0.263	0.250	0.052
Cumulative Var	0.263	0.513	**0.566**
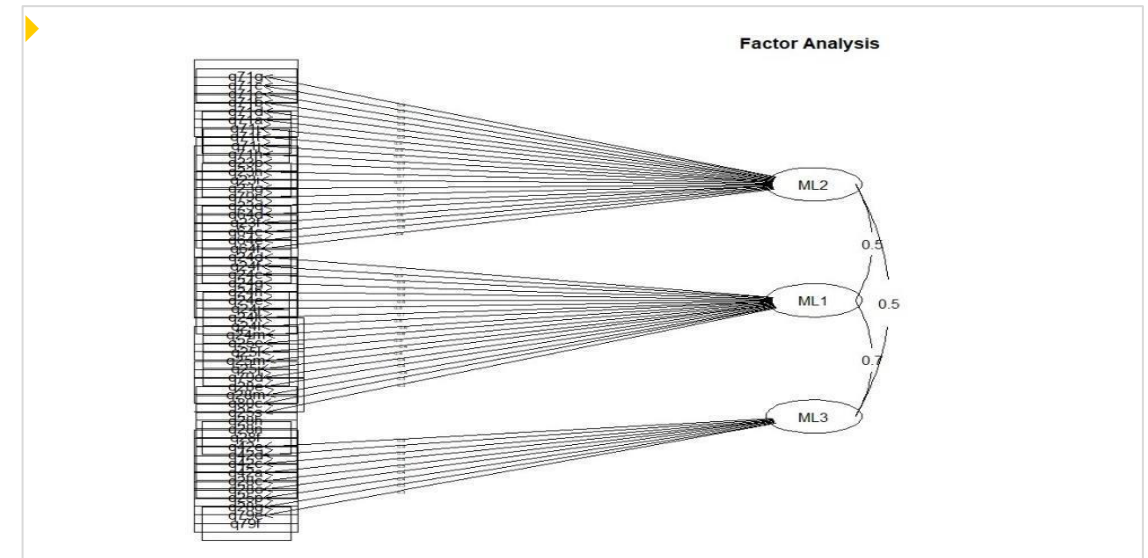
EFA MODEL 2
DATASET EXCLUDED 'EL' & 'SES'

2 FACTORS – VARIMAX ROTATION

	Factor1	Factor2
SS loadings	16.025	13.669
Proportion Var	0.302	0.258
Cumulative Var	0.302	**0.560**

3 FACTORS – VARIMAX ROTATION

	Factor1	Factor2	Factor3
SS loadings	14.247	13.729	2.938
Proportion Var	0.269	0.259	0.055
Cumulative Var	0.269	0.528	**0.583**

Factor Analysis

Factor Analysis
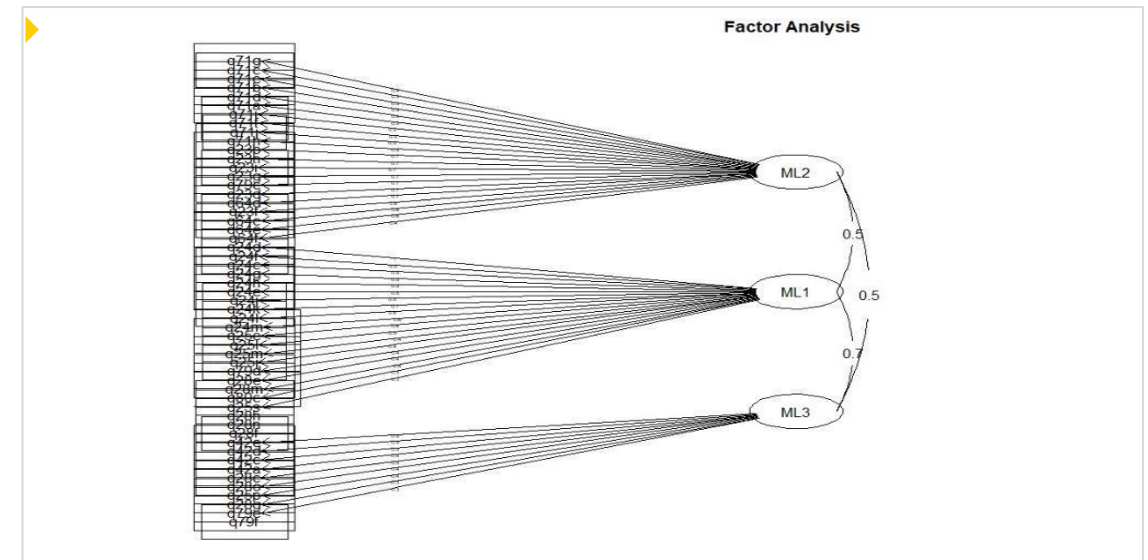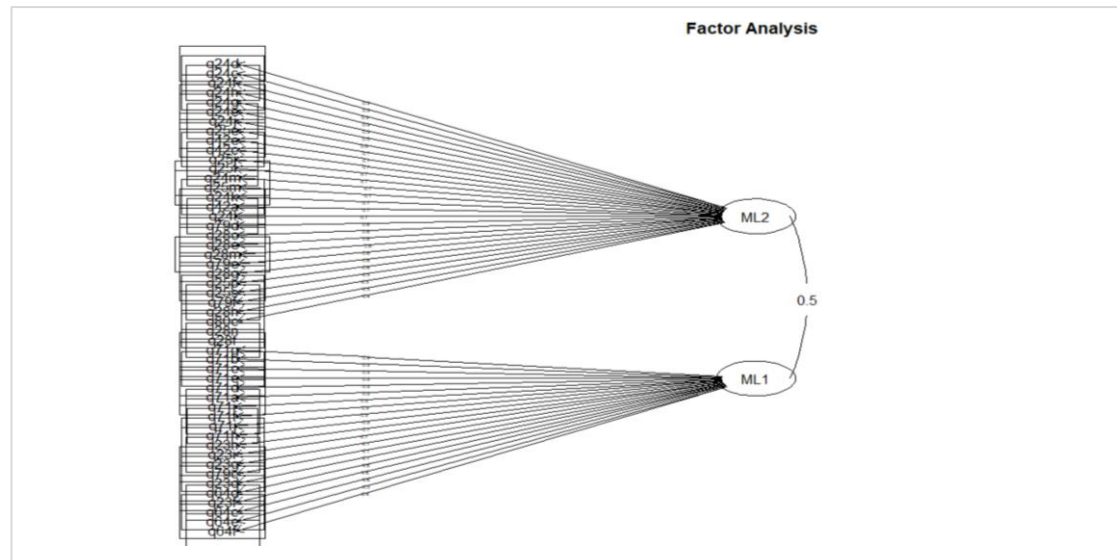
CFA IS PERFORMED FOR 3 DATASETS

FACTOR 1 CONTRIBUTES 49% VARIANCE

- q23b: My supervisor provides me with regular and constructive feedback
- q25l: My agency motivates me to help achieve its objectives
- q25m: My agency inspires me to do the best in my job
- q64d: My supervisor openly demonstrates commitment to performance management
- q71a: Achieves results
- q71b: Cultivates productive working relationships
- q71c: Exemplifies personal drive and integrity
- q71d: Shapes strategic thinking
- q71e: Communicates with influence
- q71g: Motivates people
- q71h: Encourages innovation
- q71i: Develops people
- q71j: is open to continued self-learning

FACTOR 2 CONTRIBUTES 44% VARIANCE

- q24c: In my agency, communication between SES and other employees is effective
- q24d: In my agency, SES engage with staff on how to respond to future challenges
- q24e: In my agency, SES give their time to identify and develop talented people
- q25j: SES in my agency lead by example in ethical behaviour
- q28o: Internal communication within my agency is effective
- q42a: SES act quickly to correct problems or issues that affect an employee's psychological health
- q42c: SES show support for stress prevention through involvement and commitment
- q42e: SES clearly consider the psychological health of employees to be important
- q24k: In my agency, SES behave in an accepting manner towards people of diverse backgrounds

FACTOR 3 CONTRIBUTES 50% VARIANCE

- q25e: Internal communication within my agency is effective
- q64e: My performance discussion helps me understand what is required of me and how this can be achieved
- q64f: My performance agreement provides me with meaningful and relevant information that enables me to perform my role
- q79d: When senior leaders in my agency identify a problem, they take responsibility for it

WE DETECTED ANOTHER LEADERSHIP STYLE THAT ALSO DRIVE INNOVATION

- Shapes strategic thinking
- Communicates with influence
- Motivates people
- Encourages innovation
- Develops people
- Open to continued self-learning
- Constructive feedbacks

- Motivate people
- Accept people from different background/cultures
- Effectively communicate with employees
- Quickly react to the problems
- Prevent stress for employees
- Care about well-being
- Results - oriented
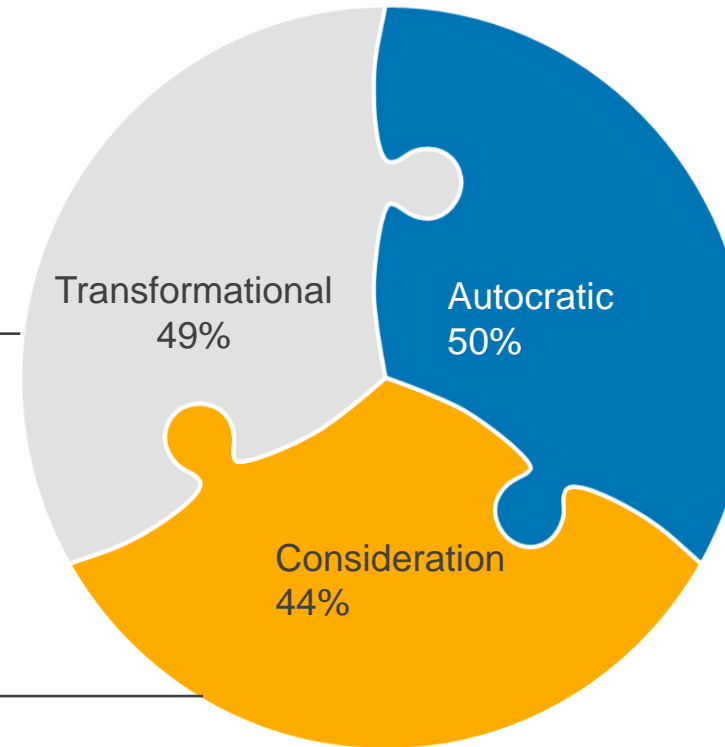
Transformational
49%

Autocratic
50%

Consideration
44%

Autocratic leaders make all the decisions themselves and don't trust anyone else to do so. The result is obvious – less motivated employees who are less likely to propose new ideas and suggestions in a 'the boss knows best' climate. When employees accept that they should do what someone else wants them to do, with no questions asked, then the results will be as expected. As an example, a common characteristic of some of the world's greatest leaders is that they have the ability to nurture other leaders. With new leaders, will come new ideas and anyone who doesn't appreciate that is unfortunately unlikely to succeed

- Take responsibility
- Provide feedbacks about performance
- Effective communication

USE REGRESSION LOGISTICS TO PREDICT
PREDICTORS ARE 3 FACTORS

LEADERSHIP STYLES BE USED TO PREDICT EMPLOYEES THAT STRIVE FOR CREATIVITY AND INNOVATION

```
Estimate Std. Error z value Pr(>|z|)

(Intercept)  1.12184     0.01083  103.59    <2e-16 ***

RC1         -5.35314     0.04252 -125.91    <2e-16 ***

RC2          2.36308     0.03001   78.74    <2e-16 ***

RC3          0.34515     0.02559   13.49    <2e-16 ***

Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

(Dispersion parameter for binomial family taken to be 1)

    Null deviance: 121884  on 95888  degrees of freedom

Residual deviance:  61396  on 95885  degrees of freedom

AIC: 61404

Number of Fisher Scoring iterations: 6
```

APS SHOULD RECRUIT SUPERVISORS WHO HAVE TRANSFORMATION AND CONSIDERATION STYLES

```
Estimate Std. Error z value Pr(>|z|)

(Intercept)  1.12184     0.01083  103.59    <2e-16 ***

RC1         -5.35314     0.04252 -125.91    <2e-16 ***

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RC3          0.34515     0.02559   13.49    <2e-16 ***

Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

(Dispersion parameter for binomial family taken to be 1)

    Null deviance: 121884  on 95888  degrees of freedom

Residual deviance:  61396  on 95885  degrees of freedom

AIC: 61404

Number of Fisher Scoring iterations: 6
```

Create a binary response variable based on the response of q72h
- Coded answers 1 (Strongly agree) and 2 (Agree) to become '1'
- Coded answers 3 (Neither disagree or agree), 4 (disagree) and 5 (strongly disagree) to become '0'

Where 1 means employees strive for creativity and innovation and 0 means they do not

Create binary response variable: q7
- We coded 'subordinate' become '0' (It means Australia departments do not recruit supervisors.)
- We coded 'manager' to become '1' (It means Australia departments recruit supervisors)

DIFFERENCES AMONG FEMALES' AND MALES' IMPRESSIONS
IMMEDIATE WORKGROUP
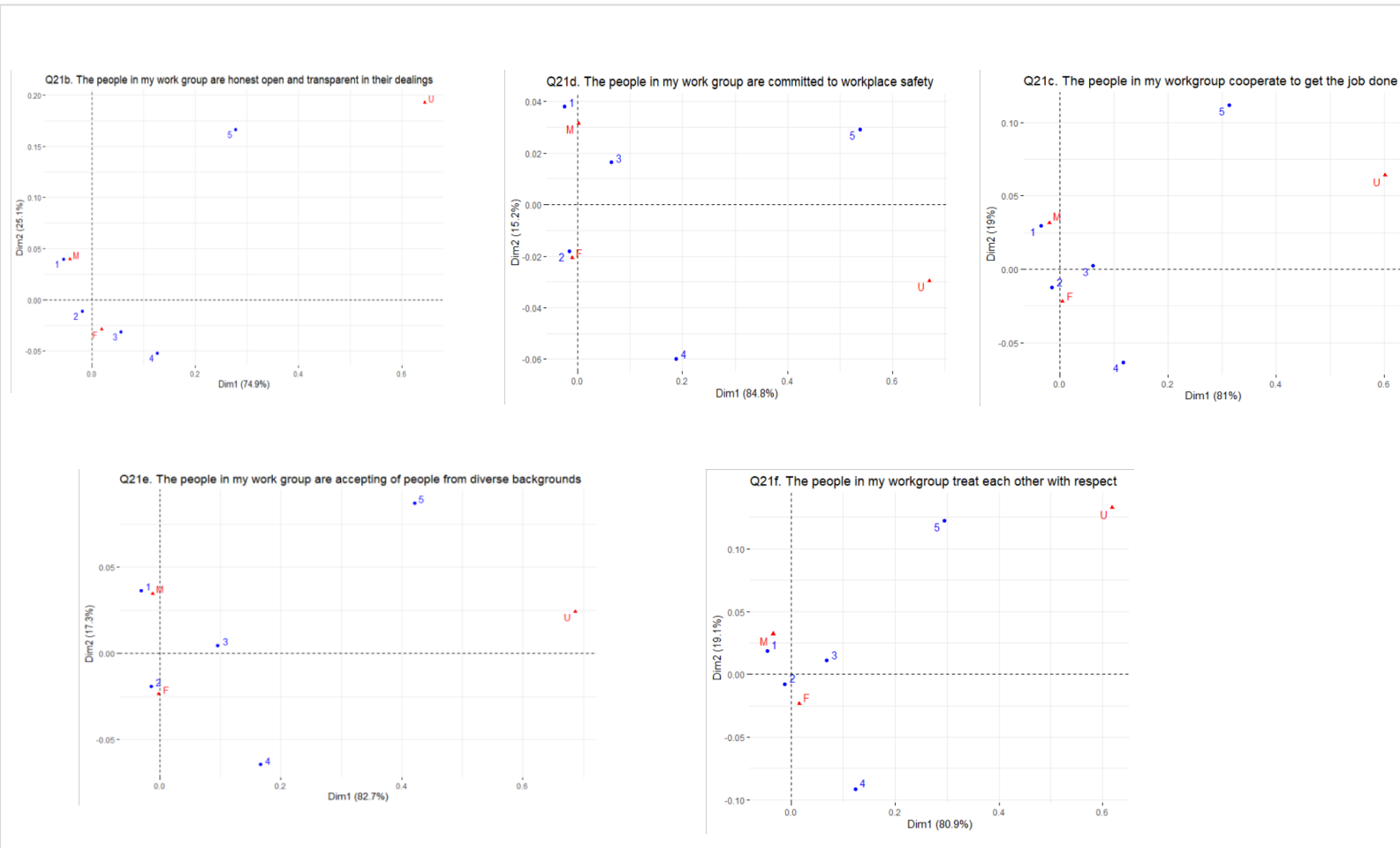
COMMENTS:
- Male group had higher impression (i.e. Strongly Agree) on the statements relating to immediate workgroup in comparison Female.

DIFFERENCES AMONG FEMALES' AND MALES' IMPRESSIONS
IMMEDIATE SUPERVISOR
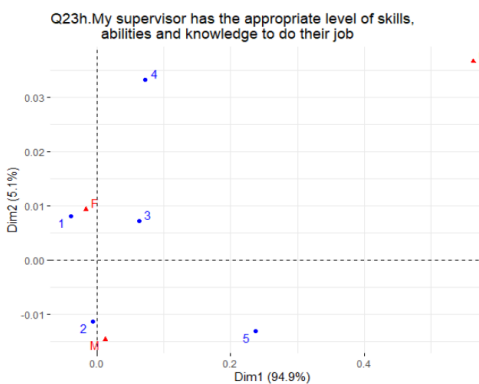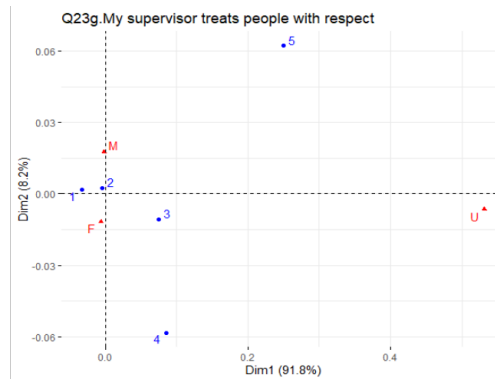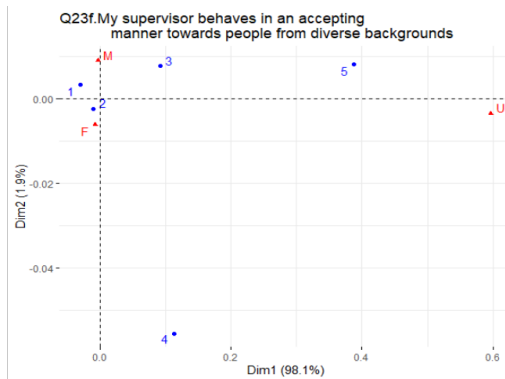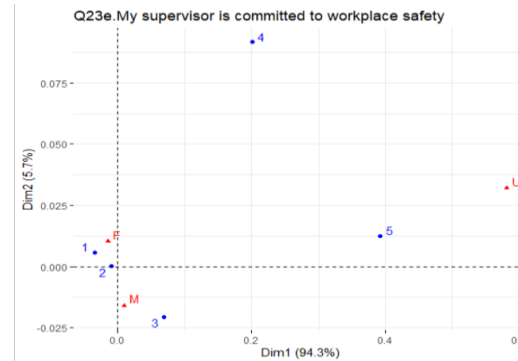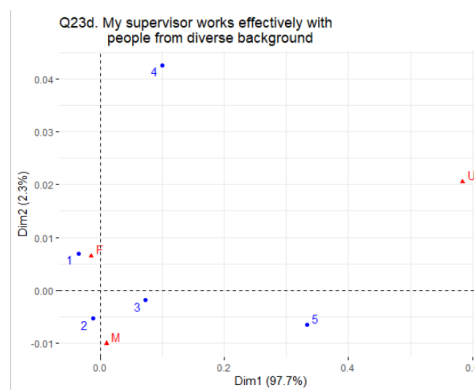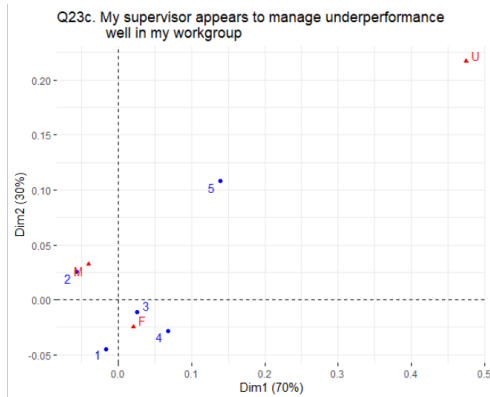
COMMENTS:

- Male group appears to have lower impression of its supervisor in comparison to female.

- In general, female tend to have a better impression on their supervisor in comparison to immediate workgroup, including below factors which were measure for both immediate workgroup and supervisor groups:

  o Treats people with respect
 o Commitment to workplace safety

SUBORDINATES' PERCEPTIONS ABOUT WELLBEING CHANGE FROM 2014
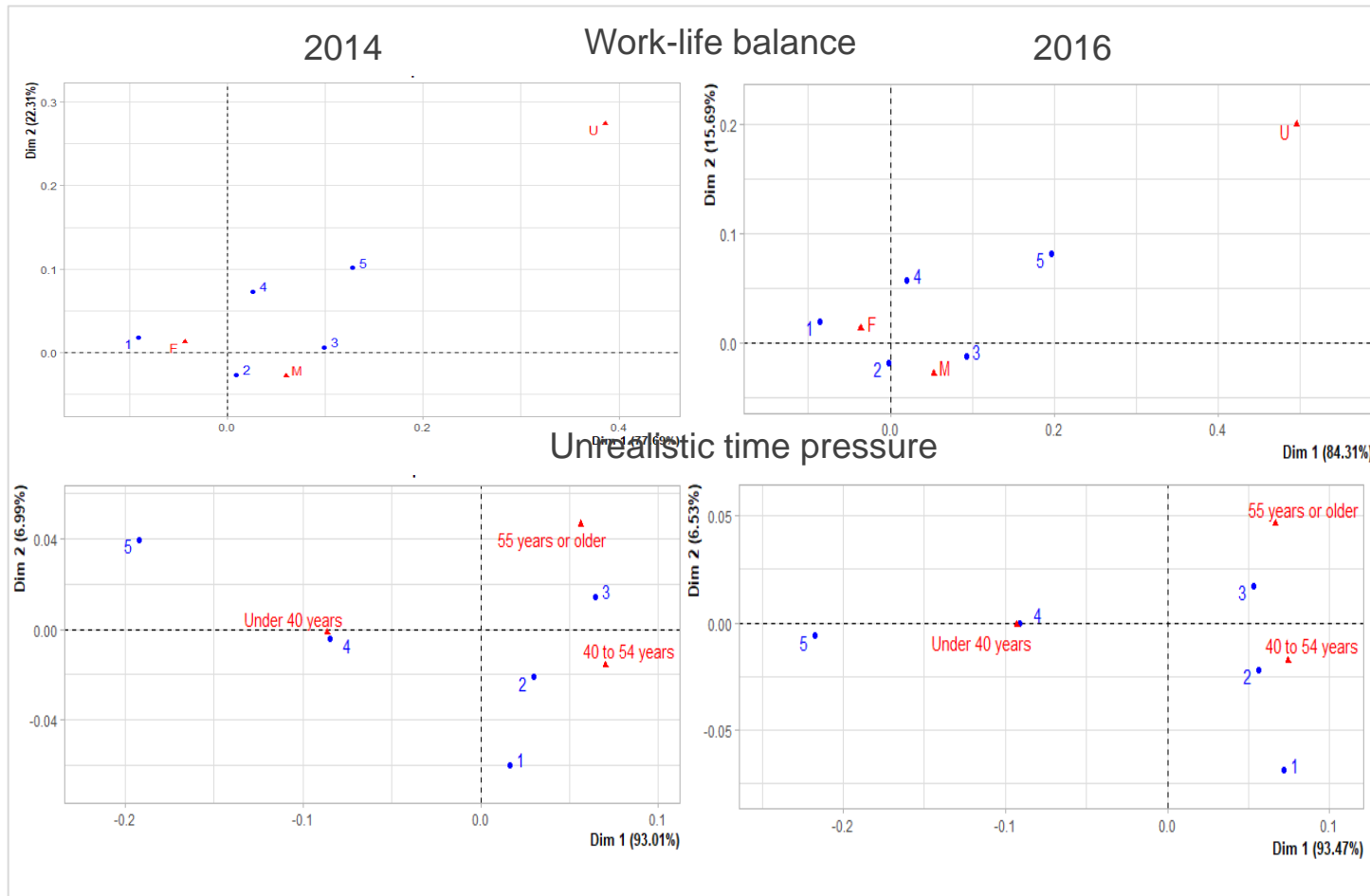
COMMENTS:

- Female cluster had higher impression (i.e., Very satisfied) in comparison to Male cluster for the work life balance in 2014 and 2016.

- Impression on work-life balance slightly declined in 2016.

- The subordinates< 40 years of age rarely feel unrealistic time pressure while older group (40 – 54 years and 55+) feel time pressure more (often to sometimes)

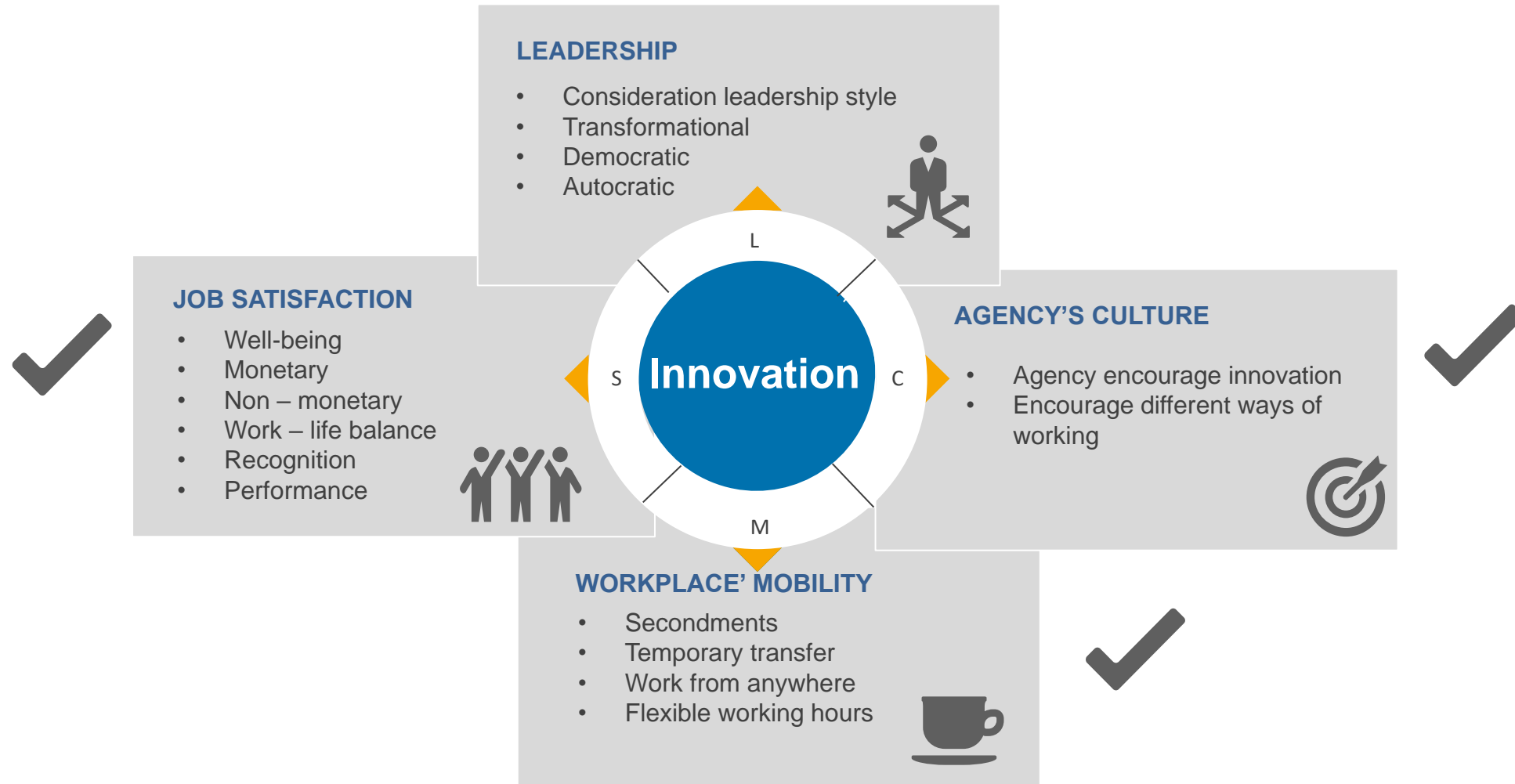# A SUBORDINATE'S PRODUCTIVITY AND WAYS OF WORKING CHANGE FROM 2014 TO 2016

Performance Discussion

2014   **Work aligns with classification level**   2016
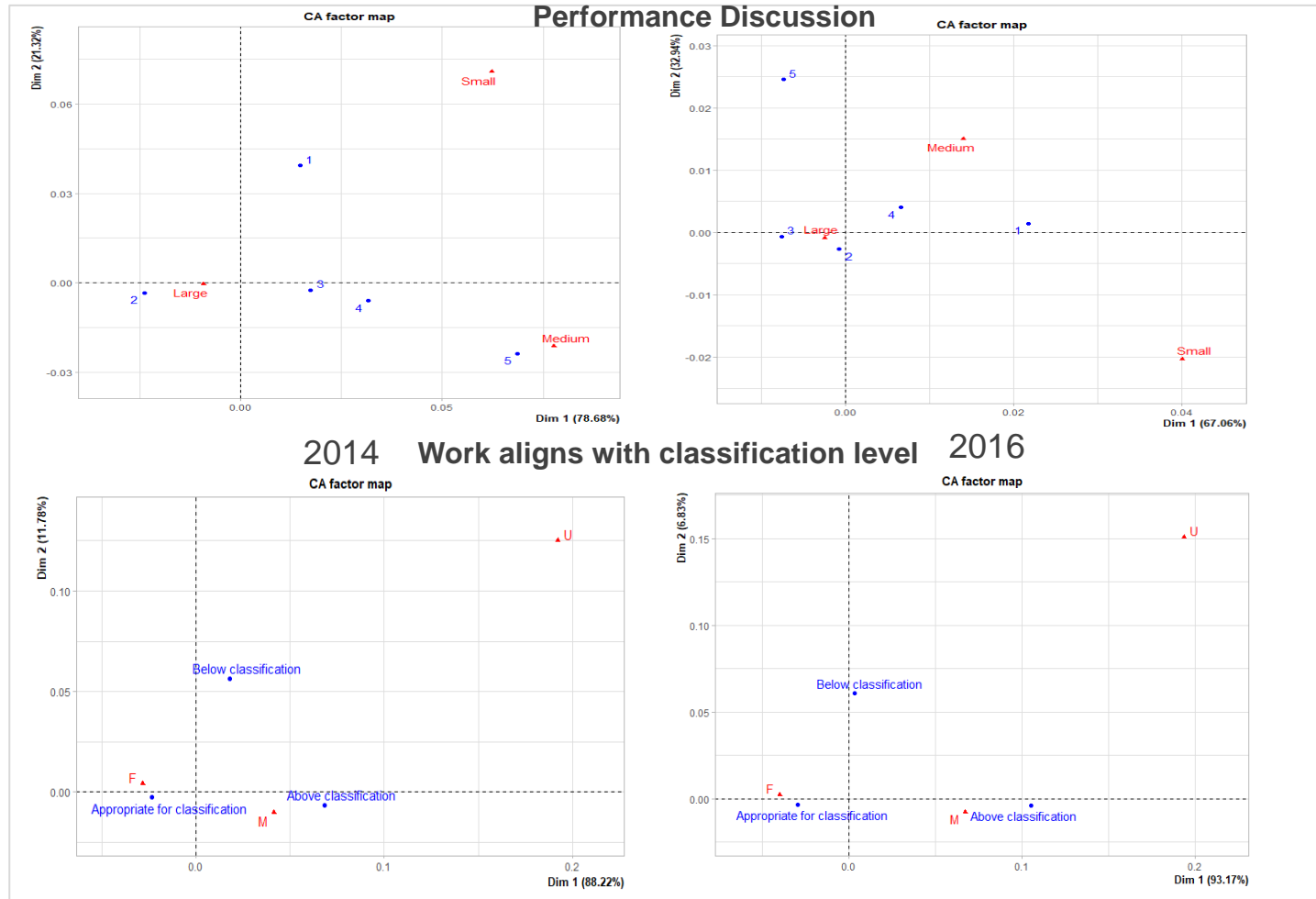
COMMENTS:
- Large agencies agreed that performance discussions was helpful in 2014. However, impression slightly decline for large agencies in 2016.

- Medium scale agencies strongly disagree with the impact of performance discussion in performing their role in 2014. This impression slightly improve in 2016.

- Female felt that their work was appropriate to their classification level while men felt that they worked above their classification. This impression remains constant in 2016
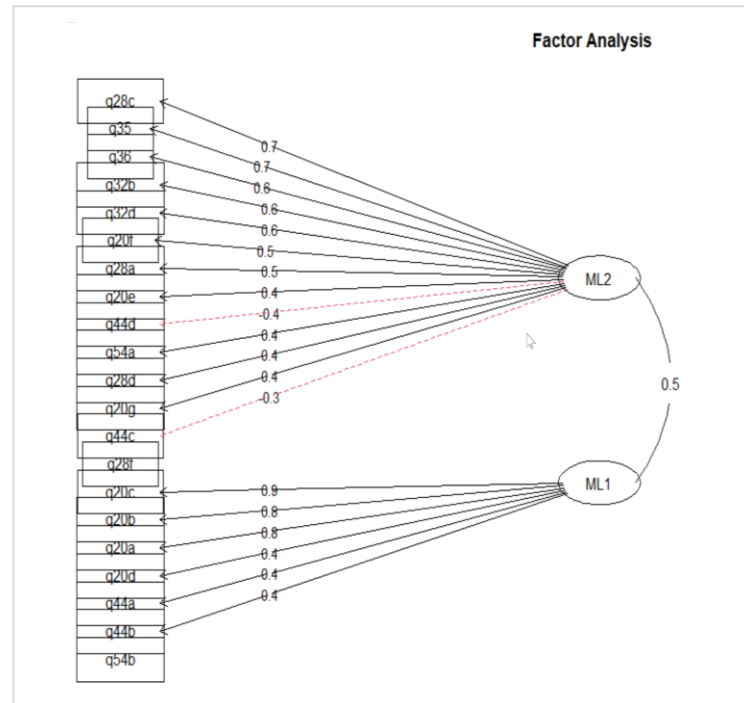
FACTORS THAT DRIVE EMPLOYEE'S INNOVATION
LEADERSHIP IS ONLY ONE FACTOR

LEADERSHIP

- Consideration leadership style
- Transformational
- Democratic
- Autocratic

Innovation

L

S   C

M

JOB SATISFACTION

- Well-being
- Monetary
- Non – monetary
- Work – life balance
- Recognition
- Performance

AGENCY'S CULTURE

- Agency encourage innovation
- Encourage different ways of working

WORKPLACE' MOBILITY

- Secondments
- Temporary transfer
- Work from anywhere
- Flexible working hours

PERFORM EFA FOR OTHER FACTORS THAT NURTURE INNOVATION
FACTOR 1

2 FACTORS

Factor Analysis

```
              ML2   ML1
SS loadings   3.972 2.941
Proportion Var 0.189 0.140
Cumulative Var 0.189 0.329
```

3 FACTORS

Factor Analysis
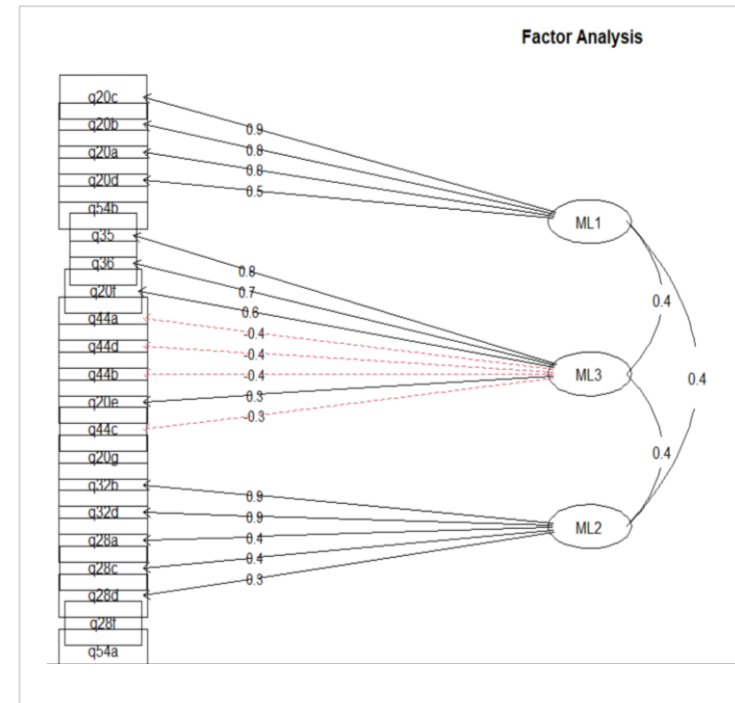
```
              ML1   ML3   ML2
SS loadings   3.074 2.525 2.242
Proportion Var 0.146 0.120 0.107
Cumulative Var 0.146 0.267 0.373
```

4 FACTORS

Factor Analysis
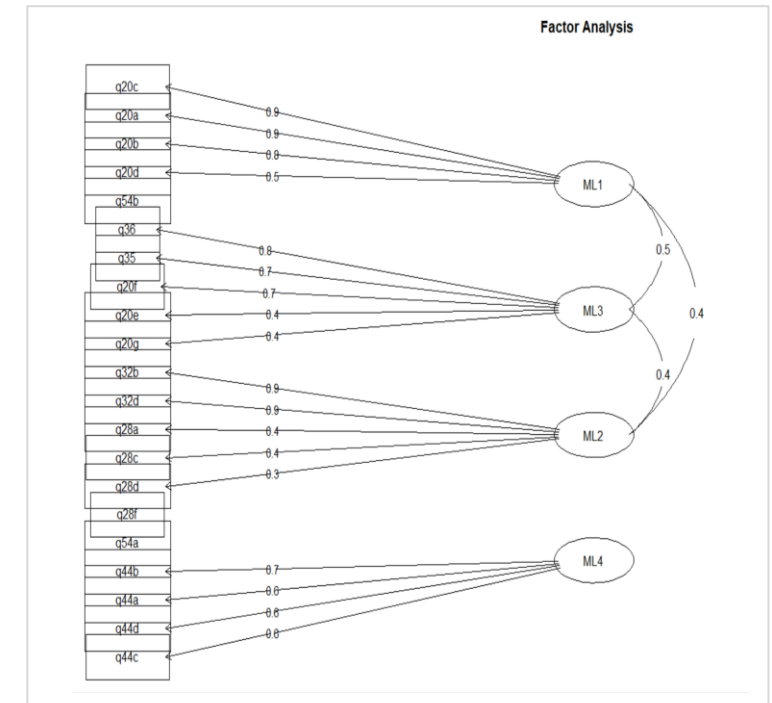
```
              ML1   ML3   ML2   ML4
SS loadings   2.677 2.325 2.217 1.737
Proportion Var 0.127 0.111 0.106 0.083
Cumulative Var 0.127 0.238 0.344 0.426
```

WORK FLEXIBILITY AND AGENCY'S CULTURE OF INNOVATION ARE IMPORTANT FACTORS

JOB SATISFACTION

- Enjoy the work
- Have ability to develop skills

1

WORK MOBILITY

Take work from the office to do at home or another location outside normal work hours

2

3

Agency has effective risk management policies and procedures

AGENCY CULTURE

4

WORK FLEXIBILITY

Satisfied with the ability to access and use flexible working arrangements

CONCLUSION & RECOMMENDATION

KEY FINDINGS

- There is **another leadership style** that the Australian government should pay attention to, we named it '**autocratic leadership'**
- There are **other factors** that drive innovation such as **work mobility and flexibility**
- **Female** provide **higher impression** (i.e. Strongly agree) in comparison to male for areas such as **work life balance, time pressure and work allocation**
- Females appear to have a **lower impression** on areas involving its **workgroup**
- **Decline** of impression for **the work-life balance** (from Agree in 2014 to Neutral in 2016)
- **Decline** in the impression of large agencies (from Agree in 2014 to Neutral in 2016) relating to the **benefit of performance discussion**

CONCLUSION & RECOMMENDATION

- Focus on **building innovation centric culture**
- Consider performing further analysis or **engagement sessions** to increase the work-life balance
- Focus on building **team dynamics** and **team building** sessions to boost the productivity and group work
- Promote effective **performance** discussion