CHAPTER 5

ANALYSIS AND PRESENTATION OF RESULTS

		Page
1	**Introduction**	204
2	**Qualitative results**	205
2.1	Results of individual interviews	205
2.1.1	Results: Impact of self-directed team learning dynamics within self-managed air traffic control work teams	210
2.1.2	Results: Impact of teamwork on air traffic control workplace performance outcomes	210
2.1.3	Results: Impact of self-directed team learning in the air traffic control workplace continuation training scenario	210
2.2	Results of focus group interviews	211
2.2.1	Results: Impact of teamwork on air traffic control workplace performance outcomes	214
2.2.2	Results: Impact of self-directed team learning dynamics within self-managed air traffic control work teams	214
2.2.3	Results: Impact of self-directed team learning in the air traffic control workplace continuation training scenario	215
3	**Quantitative results**	297
3.1	Self-directed Team Learning Questionnaire (SDTLQ) results	297
3.1.1	Self-directed Team Performance results	298
3.1.2	Self-directed Team Learning results	306
3.1.3	Team performances and self-directed team learning relationship results	317
3.1.4	Continuation training results	318
3.2	Team learning approaches and self-directed team relationship results	319
4	**Conclusion**	324

Figure 5.1 Chapter 5 orientation

Introduction		
Qualitative results	Results of individual interviews	Results: Impact of teamwork on air traffic control workplace performance outcomes
		Results: Impact of self-directed team learning dynamics within self-managed air traffic control work teams
		Results: Impact of self-directed team learning in the air traffic control workplace continuation training scenario
	Results of focus group interviews	Results: Impact of teamwork on air traffic control workplace performance outcomes
		Results: Impact of self-directed team learning dynamics within self-managed air traffic control work teams
		Results: Impact of self-directed team learning in the air traffic control workplace continuation training scenario
Quantitative results	Self-directed Team Learning Questionnaire (SDTLQ) results	Self-directed Team Performance results
		Self-directed Team Learning results
		Team performances and self-directed team learning relationship results
		Continuation training results
	Team learning approaches and self-directed team relationship results	
Conclusion		

Compiled by the researcher

1 Introduction

Introduction 

In Chapter 4 the research design, methodology, processing and reporting procedures of research data were discussed. Analysis and results of data are presented in this chapter in two phases:

- qualitative results; and
- quantitative results.

Qualitative results, which relied upon individual interview data and focus group interview data, will be reported during the first phase. Individual interview data and focus group interview data collected in this study were categorised in order to facilitate an analysis (and a discussion of findings, integration of findings and contextualising of results in Chapter 6) of:

- the effect of teamwork on workplace air traffic control performance outcomes;
- the influence of teamwork on the individual's work performance; and
- learning that resulted from air traffic control teamwork experiences.

Quantitative results, which relied upon Self-directed Team Learning Questionnaire (SDTLQ) and Learning Approach Questionnaire (LAQ) data, will be reported during the second phase. SDTLQ data will statistically be analysed in terms of:

- self-directed team performance results;
- self-directed team learning results;
- team performances and self-directed team learning relationship results; and
- continuation training results.

LAQ statistical results will focus on:

- learning approach results in terms of learning content (LAQc); and
- learning approach results in terms of social orientation (LAQs).

SDTLQ and LAQ statistical data will be utilised to analyse and present team learning approaches and self-directed team learning relationship results.

2 Qualitative results

Qualitative results	**Results of individual interviews**	**Results: Impact of teamwork on air traffic control workplace performance outcomes**
		Results: Impact of self-directed team learning dynamics within self-managed air traffic control work teams
		Results: Impact of self-directed team learning in the air traffic control workplace continuation training scenario
	Results of focus group interviews	**Results: Impact of teamwork on air traffic control workplace performance outcomes**
		Results: Impact of self-directed team learning dynamics within self-managed air traffic control work teams
		Results: Impact of self-directed team learning in the air traffic control workplace continuation training scenario

2.1 Results of individual interviews

During each individual interview three questions were posed. Twenty-five air traffic controllers were interviewed and recorded individual interview participant views and experiences were transcribed. Transcribed responses received alpha-numerical values which were allocated in accordance with the three questions posed during each individual interview. This first step is illustrated in Table 5.1.

Table 5.1 Alpha-numerical codes[1]

Individual interview question 1	"Explain with the aid of examples how teamwork influences the outcome of the air traffic control service provided by your centre?"											
Rationale for posing this question	Understanding the impact/influence of teamwork on workplace performance outcomes; emphasising the team's contribution towards air traffic control performance outcomes and the team's learning strategies.											
Alpha-numerical codes												
A.1.	B.1.	C.1.	D.1.	E.1.	F.1.	G.1.	H.1.	I.1.	J.1.	K.1.	L.1.	M.1.
N.1.	O.1.	P.1.	Q.1.	R.1.	S.1.	T.1.	U.1.	V.1.	W.1.	X.1.	Y.1.	

[1] The letter **A** refers to the candidate. **A.1.** refers to candidate 1 and his/her response to question 1.

Individual interview question 2			"Explain with the aid of examples how learning from air traffic control teamwork experiences influences your own performance?"									
Rationale for posing this question			Understanding the impact/influence of teamwork on the individual's performance; emphasising the team's contribution towards air traffic control performance outcomes and the team's learning strategies.									
Alpha-numerical codes												
A.2.	B.2.	C.2.	D.2.	E.2.	F.2.	G.2.	H.2.	I.2.	J.2.	K.2.	L.2.	M.2.
N.2.	O.2.	P.2.	Q.2.	R.2.	S.2.	T.2.	U.2.	V.2.	W.2.	X.2.	Y.2.	
Individual interview question 3			"Explain with the aid of examples how learning from experience influences air traffic control teamwork?"									
Rationale for posing this question			Understanding the impact/influence of learning from experience on teamwork; emphasising the team's contribution towards air traffic control performance outcomes and the team's learning strategies.									
Alpha-numerical codes												
A.3.	B.3.	C.3.	D.3.	E.3.	F.3.	G.3.	H.3.	I.3.	J.3.	K.3.	L.3.	M.3.
N.3.	O.3.	P.3.	Q.3.	R.3.	S.3.	T.3.	U.3.	V.3.	W.3.	X.3.	Y.3.	

Compiled by the researcher

Transcripts allowed for categorisation and analysis of data[2]. These transcript categories were inductively analysed and grouped as:

- narrative codes derived from actual statements[3];
- key descriptive terms;
- subcategories; and
- categories.

Narrative codes derived from actual statements were the result of a summary of participant statements. I ensured that the original meaning and intention was not consciously distorted. These summaries allowed me to extract important aspects from the data itself and then to present these in a logical and condensed manner and order. Narrative codes derived from actual statements formed the point of departure for all key descriptive terms, subcategories and categories. Coding of data was primarily facilitated by literature

[2] An external coder was used to ensure that categories and subcategories identified were based on scientific principles. Data were presented as accurately as possible and based on qualitative analysis principles (reference: Appendix J).
[3] Narrative codes derived from actual statements are presented in Tables 5.9-5.11.

referencing in order to ensure coding accuracy and own understanding. Key descriptive terms transpired during transcript analyses and formulation of narrative codes. These efforts allowed me to formulate collective terms that accurately described narrative codes. Key-descriptive terms that emerged are presented in Table 5.2.

Table 5.2 Key descriptive terms

Key descriptive terms		
Co-learning preferences	Personal learning preferences	Planned learning preferences
Critical analysis	Informal discussions	Formal discussions
Resourcefulness	External aided learning	Design considerations
Implementation responsibility	Evaluation focus	Team building
Learning transmission	Encouragement	Inhibitors
Socialising	Involvement	Dynamics
Facilitation considerations	Value	Team roles
Power base	Individual focal point	Synergy
Team relationships	Team assistance	Teamwork criticism
Conformity pressures	Teamwork environment	Status influences
Learning	Team conflict	Diversity
Teamwork problems	Team member focus	Collective focus
Safety concerns	Team planning	Team outputs
Team coordination	Duty responsibility	Team communication
Team's work processes	Supervision activities	Personal reflection
Support needs	Influencing performance	Understanding teams
Personal value	Performance assistance	Performance problems
Team performance	Status impact	Information sharing
Helpfulness	Fellowship	Trust and respect
Performance breakdowns	Characteristics	Formal climate
Conditions	Significance	

Compiled by the researcher

Subcategories were developed by identifying properties in the key descriptive terms that could be linked to SDTLQ topic indicators and literature groups. This approach that followed an alignment with the SDTLQ

was supported in lieu of its triangulation possibilities. Key descriptive terms and associated subcategories that transpired are presented in Table 5.3.

Table 5.3 Key descriptive terms and associated subcategories

Key descriptive terms	Subcategories	Designator
Co-learning preferences Personal learning preferences Planned learning preferences	Individual learning preferences	TLA
Critical analysis Informal discussions Formal discussions Resourcefulness	Participative learning	TLB
External aided learning	Individual learning orientation	TLC
Design considerations	Training design	TLD
Implementation responsibility	Training implementation	TLE
Evaluation focus	Training evaluation	TLF
Team building Learning transmission Encouragement Inhibitors	Operational training characteristics	TLG
Socialising Involvement Dynamics	Learning environment	TLH
Facilitation considerations Value	Team learning facilitation	TLI
Team roles Power base Individual focal point Synergy Team relationships Team assistance Teamwork criticism	Teamwork characteristics	TMA

Conformity pressures Teamwork environment Status influences Learning Team conflict Diversity Teamwork problems		
Team member focus Collective focus	Self-efficacy	TMB
Safety concerns Team planning Team outputs Team coordination Duty responsibility Team communication Team's work processes Supervision activities	Teamwork activities	TMC
Personal reflection Support needs Influencing performance Understanding teams Personal value	Performance reflection	TMD
Performance assistance Performance problems Team performance Status impact	Teamwork performance measures	TME
Information sharing Helpfulness Fellowship Trust and respect Performance breakdowns	Teamwork dynamics	TMF
Characteristics	Continued learning strategies	CLA
Formal climate	Continued learning environment	CLB

Conditions	Continued learning expectations	CLC
Significance	Continued learning value	CLD

Compiled by the researcher

Similar subcategories were then identified and categorised. Categories and associated subcategories that emerged are presented in Table 5.4.

Table 5.4 Categories and associated subcategories

Categories	Category designators	Associated subcategories (designators)
Team learning	TL	TLA, TLB, TLC, TLD, TLE, TLF, TLG, TLH & TLI
Team performance	TP	TMA, TMB, TMC, TMD, TME & TMF
Continued learning	CL	CLA, CLB, CLC & CLD

Compiled by the researcher

2.1.1 Results: Impact of self-directed team learning dynamics within self-managed air traffic control work teams

Team learning narrative codes summarised from actual statements, supportive transcript extracts, summary of key descriptive terms; subcategories; and categories are presented in Table 5.9.

2.1.2 Results: Impact of teamwork on air traffic control workplace performance outcomes

Team performance narrative codes summarised from actual statements, supportive transcript extracts, summary of key descriptive terms; subcategories; and categories are presented in Table 5.10.

2.1.3 Results: Impact of self-directed team learning in the air traffic control workplace continuation training scenario

Team continuation training narrative codes summarised from actual statements, supportive transcript extracts, summary of key descriptive terms; subcategories; and categories are presented in Table 5.11.

2.2 Results of focus group interviews

Three focus group interviews were conducted and each focus group comprised four respondents. Recorded focus group interview participant views and experiences were transcribed[4]. Transcribed responses received alpha-numerical values which were allocated in accordance with the three questions posed during each focus group interview. This first step is illustrated in Table 5.5.

Table 5.5 Alpha-numerical codes[5]

Focus group interview question 1	"What can a team member, joining the air traffic control team, expect from the team?"		
Rationale for posing this question	Understanding the impact/influence of teamwork on workplace performance outcomes; emphasising the team's contribution towards air traffic control performance outcomes and the team's learning strategies.		
Alpha-numerical codes			
ZA.1	ZB.1	ZC.1	
Focus group interview question 2	"How is individual and collective learning planned and executed at your air traffic control centre?"		
Rationale for posing this question	Understanding the impact/influence of teamwork on the individual's performance; emphasising the team's contribution towards air traffic control performance outcomes and the team's learning strategies.		
Alpha-numerical codes			
ZA.2	ZB.2	ZC.2	
Focus group interview question 3	"How can air traffic control team learning at your centre be improved?"		
Rationale for posing this question	Understanding the impact/influence of learning from experience on teamwork; emphasising the team's contribution towards air traffic control performance outcomes and the team's learning strategies.		
Alpha-numerical codes			
ZA.3	ZB.3	ZC.3	

Compiled by the researcher

[4] An external coder was used to ensure that categories and subcategories identified were based on scientific principles. Data were presented as accurately as possible and based on qualitative analysis principles (reference: Appendix J).

[5] The letter **ZA** refers to the specific focus group.
ZA.1. refers to focus group 1 and this group's response to question 1.

Transcripts allowed for categorisation and analysis of data. These transcript categories were inductively analysed and grouped as:

- narrative codes derived from actual statements[6];
- key descriptive terms;
- subcategories; and
- categories.

Narrative codes derived from actual statements were the result of a summary of focus group statements. I ensured that the original meaning and intention was not consciously distorted. These summaries allowed me to extract important aspects from the data itself and then to present these in a logical and condensed manner and order. These narrative codes derived from actual focus group statements formed the point of departure for all key descriptive terms, subcategories and categories. Coding of data was primarily facilitated by literature referencing in order to ensure coding accuracy and own understanding. Key descriptive terms transpired during transcript analyses and formulation of narrative codes. These efforts allowed me to formulate collective terms that accurately described narrative codes. Key-descriptive terms that emerged are presented in Table 5.6.

Table 5.6 Key descriptive terms

Key descriptive terms		
Diagnosis	Skills development	Informal discussion
Formal learning	Internal-directed	Design considerations
Implementation goal	Team building	Learning transmission
Socialising	Involvement	Dynamics
Facilitation considerations	Value	Team relationships
Conformity pressures	Individual focal point	Team roles
Collective focus	Duty responsibility	Reflection
Support provided	Value	Threat
Attitude	Characteristics	Conditions
Condition	Significance	Limitations

Compiled by the researcher

[6] Narrative codes derived from actual statements are presented in Tables 5.12-5.14.

Subcategories were developed by identifying properties in the key descriptive terms that could be linked to SDTLQ topic indicators and literature groups. This approach that followed an alignment with the SDTLQ was supported in lieu of its triangulation possibilities.

Key descriptive terms and associated subcategories that transpired are presented in Table 5.7.

Table 5.7 Key descriptive terms and associated subcategories

Key descriptive terms	Subcategories	Designator
Diagnosis Skills development	Individual learning preferences	TLA
Informal discussion Formal learning	Participative learning	TLB
Internal-directed	Individual learning orientation	TLC
Design considerations	Training design	TLD
Implementation goal	Training implementation	TLE
Team building Learning transmission	Operational training characteristics	TLG
Socialising Involvement Dynamics	Learning environment	TLH
Facilitation considerations Value	Team learning facilitation	TLI
Team relationships Conformity pressures Individual focal point Team roles	Teamwork characteristics	TMA
Collective focus	Self-efficacy	TMB
Duty responsibility	Teamwork activities	TMC
Reflection Support provided Value	Performance reflection	TMD

Threat		
Attitude	Teamwork dynamics	TMF
Characteristics	Continued learning strategies	CLA
Conditions	Continued learning environment	CLB
Condition	Continued learning expectations	CLC
Significance Limitations	Continued learning value	CLD

Compiled by the researcher

Similar subcategories were then identified and categorised. Categories and associated subcategories that emerged are presented in Table 5.8.

Table 5.8 Categories and associated subcategories

Categories	Category designators	Associated subcategories (designators)
Team learning	TL	TLA, TLB, TLC, TLD, TLE, TLG, TLH & TLI
Team performance	TP	TMA, TMB, TMC, TMD & TMF
Continued learning	CL	CLA, CLB, CLC & CLD

Compiled by the researcher

2.2.1 Results: Impact of self-directed team learning dynamics within self-managed air traffic control work teams

Team learning narrative codes summarised from actual statements, supportive transcript extracts, summary of key descriptive terms; subcategories; and categories are presented in Table 5.12.

2.2.2 Results: Impact of teamwork on air traffic control workplace performance outcomes

Team learning narrative codes summarised from actual statements, supportive transcript extracts, summary of key descriptive terms; subcategories; and categories are presented in Table 5.13.

2.2.3 Results: Impact of self-directed team learning in the air traffic control workplace continuation training scenario

Team learning narrative codes summarised from actual statements, supportive transcript extracts, summary of key descriptive terms; subcategories; and categories are presented in Table 5.14.

Table 5.9 Results: Impact of self-directed team learning dynamics within self-managed air traffic control work teams

Alpha-numerical codes	Summary of narrative codes derived from actual statements[7]	Descriptive key terms	Subcategories	Categories
A.2.8	An acceptance to learn from all team members exists Being content/happy with your job assists the learning experience	Co-learning preferences	Individual learning preferences (TLA)	Team learning (TL)
C.3.3	Listening to others			
C.3.7	Watching others at work encourages learning			
E.2.7	People are used as resources – asking the one who most likely will have the answer			
E.2.8	Learning by asking			
F.2.3	Actively seeking others' experiences			
F.2.5	Learning actually starts when you work alone			
F.2.7	Team helps in development of own experience			
F.3.11	Observing others while they are working aids learning			
F.3.12	Learning by observing a work role that you have not yet qualified aids to create further/extended understanding			
G.2.3	Watch others control assist with own learning			
G.3.9	Learning by observing others control			
J.3.11	Learn by observing others			
J.3.13	People want to sit and observe others			

[7] Narrative codes were derived from transcripts.

K.2.6	Controllers observe each other and critically evaluate each other and themselves			
L.2.1	People looking on and learning			
M.2.2	During busy spells everyone gets more focused			
M.3.5	Controllers observe each other at work			
N.2.2	Looking at the task and the teamwork			
W.2.9	I also speak to clients and listen to their feedback			
Supportive transcript extracts[8]				
I would afterwards go and sit with someone else and discuss certain issues – how for instance the height of the cloud ceiling affects things like initial with regards to circuit traffic, things like that – because it just at that stage I did not have that level of experience (F.2.3). *… and then a senior can possibly say – "you know what, I had exactly the same and we did this or that or whatever, or oh hell I didn't realise that." And then you can build upon this, but again it all depends on the dynamics of the team because again there are places where you are just told, "suck it up" – "how on earth can the (senior rank) be making a mistake, it is physically impossible, it cannot happen?" Because you know that when I was a (junior rank) the (more senior rank) said "yours" and I handled it, so obviously you must be sub-standard! So that is the other process that is obviously not going to work for a team … (J.3.11).* *In the beginning it was all watching, so it was just learning, finding out what happens here (N.2.2).*				
B.2.1	People learn from previous mistakes	Personal learning preferences	Individual learning preferences (TLA)	Team learning (TL)
B.2.2	Learning through adverted mistakes			
B.2.9	Learn by observing			
C.2.1	Everyday is viewed as a learning opportunity			
G.1.10	You must improve yourself to improve the team's performance			
G.3.2	Every day is a learning occasion			

[8] Transcript examples that support narrative codes are provided

G.3.11	You need to combine various inputs received and determine your own from a process of combining inputs			
H.3.1	Incidents are important learning opportunities			
I.2.1	I did not feel comfortable with my skills after validation			
I.2.5	I learn by sitting and looking			
I.2.6	I will ask "why?"			
I.2.10	Don't want to show others my or other people's shortcomings			
I.3.1	Use of cues to facilitate attention (rubber band on left hand)			
M.2.1	Individual pressure enhances own learning			
N.2.1	Learning by looking/watching			
N.3.2	Watching others during emergencies is a learning opportunity			
P.1.9	Experience is best acquired during observation			
U.3.3	You learn from your own mistakes			
Y.1.12	Observing others while controlling			
Supportive transcript extracts				
I learn by observing (B.2.9). *I have learned that the more pressure you put onto you sometimes … certain individuals just start performing better. It normally happens; I've seen it in netball, when you play netball you play in a team; the moment you have got a strong team that you are playing against your whole level of … just picks up (M.2.1).* *Because I told an aircraft (ATC procedure) … so every time I work with you I notice that you are doing this and this, which I am not happy about. The one time that I had to approach a senior about what he did during the period … (Y.1.12).*				

N.2.4	One standard of instruction aids own learning	Planned learning preferences	Individual learning preferences (TLA)	Team learning (TL)
N.2.5	Learning standards are passed from one instructor to the next			
N.2.8	Learning starts with a theory foundation			
P.2.4	Certain answers are not obtained through analysis which requires critical thinking			
Q.2.2	Workplace training is reliant on one-to-one training			
Q.3.2	Adequate training is important			
X.3.1	Morning formal briefings are used to share information/experiences			
Supportive transcript extracts				
Well, obviously it starts off with theory – they, you do all your exams … so you do those (number) exams and then you go off to do your practical (N.2.8). *He must have the adequate training … to make it adequate here … I will say … (Q.3.2).*				
A.2.5	Learning is reflected upon and remembered and used when the situation in future demands	Critical analysis	Participative learning (TLB)	Team learning (TL)
A.2.6	Team members learn to change own views due to reflecting upon experiences and by learning from others			
C.2.5	Playing scenarios in my head			
C.3.2	Consciously being aware of own experiences			
F.3.1	Talking about own experiences after a shift			
Supportive transcript extracts				
You discuss it, it is good to talk … (ATC example/situation stated) - afterwards he asked - do you understand the application of my separation? He said doing what you did you created a reduction in my airspace – I never knew that ... "Thanks now I know". That is how you learn by discussing these little things; that is basically how I learn. And also sometimes playing scenarios over and over in your head and – I could maybe do this, I could maybe do that! (C.2.5).				

Alright, very often you have things happening during a period and by means of communicating afterwards about certain …; people do not always have the freedom, lets start there, do not always feel the freedom to express themselves and say –"I have had this experience" (F.3.1).				
A.3.7	Informal learning is prompted by quick chats; talking about recent past events that were problematic – these conversations rely upon mutual respect – in order to be effective the issue and not the person is discussed	Informal discussion	Participative learning	Team learning
C.2.4	After-hours informal discussions aid learning		(TLB)	(TL)
D.3.6	Certain people do not participate in discussions – due to lack of confidence and/or seniority			
E.2.4	Experience plays a big role			
F.2.2	Learning supported by discussions and feedback			
F.3.2	Small group discussions take place amongst members of equal seniority			
F.3.4	Focus of informal discussions is practical encounters			
F.3.10	Sharing experiences aids learning			
G.3.1	During informal conversation seniors share past experiences and stories			
H.2.1	Experiences are continuously shared			
H.2.4	People discuss occurrences and provide inputs and ask more questions			
H.3.8	You learn from situations and then share those experiences			
H.3.9	Constructive experience sharing is required to ensure interest and learning			
I.3.4	Experiences are shared informally by discussion			
J.3.10	Informal learning takes place by discussion			
J.3.12	People discuss occurrences with each other			
J.3.14	People debate solutions			

K.2.5	Experiences are shared			
K.2.8	Controllers engage in post-shift discussions			
K.3.3	A willingness to share information is present			
L.1.4	Information must be shared			
L.2.8	Lot of informal learning			
L.3.1	Everybody talks about situations			
L.3.2	Experiences are valued in effective teamwork			
L.3.4	Informal and socially based learning takes place			
M.3.2	Controllers talk freely about occurrences			
M.3.3	Discussion is held in an informal manner			
M.3.6	Everyone is willing to learn from others' experiences			
M.3.9	Humour/innocently making fun is also used to drive learning messages home			
N.3.5	Everyone discusses what happened			
O.1.11	Sharing of ideas/experiences by discussion			
O.2.1	The team's learning is positively influenced by discussions			
O.2.6	Experience based learning is very helpful			
O.3.1	Experience is shared by means of discussions			
O.3.2	Own mistakes are discussed with others			
P.1.7	Information need to be shared			
P.1.8	Experience examples serve as inputs for conversations			
P.1.11	Shortcomings are addressed by informal briefings			
P.2.5	Experience accumulation is critical for learning			

P.3.1	Training is essentially informal			
Q.3.4	Experiences are shared and everyone learns and participates			
R.3.3	Sharing of experiences is essential			
R.3.4	The team must use experiences to ensure learning takes place			
S.1.1	Teamwork is essential for effective information transfer			
S.2.2	Experiences are shared and performance is discussed			
T.1.8	Team members pass information and experiences to newcomers			
T.2.5	Everyone is involved in team discussions			
T.3.8	Discussions with clients and colleagues serve as a learning occasion			
T.3.9	Attending client meetings serve as a learning event			
U.3.2	You learn from other's mistakes – it is discussed			
U.3.11	I enjoy discussions			
V.2.10	Social things are discussed at work more than work things			
V.2.12	Story telling has also started			
V.3.2	Learning from experience is necessary			
V.3.4	Teamwork is enhanced by discussions			
W.2.5	Workplace errors are discussed			
W.2.6	Team members seek confidants and share experiences with them			
Y.2.6	Controllers sharing own experiences with students			
Y.3.7	Informal gatherings are better than formal gatherings			
Supportive transcript extracts				
Again it depends on the team dynamics, I think personally here it is encouraged because everybody here has realised that I must rather learn from your mistakes				

than go and make the same mistake myself, as well as the ability to allow the junior to voice his concerns because it is seen as … not your formal learning, but your informal learning taking place, where you got a chance to discuss, … as well as then freedom to say – "you know that didn't work today or I don't know why that happened today" (J.3.10). *… and that for me is always a learning experience because the best way of learning is learning from other peoples mistakes and try not to make that same mistake obviously. And if you make a mistake you learn from it as well (U.3.2).* *… we have got extreme personalities in each direction in this tower (colleague names and descriptions stated). I think I know more people on a personal basis in the tower than anybody else in the tower. Like they will talk to me, but they won't stand up in front of the whole crew room and say – "this is what I did, or I have a suggestion for this and that" (W.2.6).*				
B.3.7	Use of briefings	Formal discussions	Participative learning (TLB)	Team learning (TL)
B.3.8	Participation by all during briefings invited/supported			
B.3.11	Attendance of external briefings by senior members			
D.3.9	Suggest a team work-related discussion that favours a more formal approach			
K.3.1	Documented experiences – quality circle book			
L.2.9	Formal learning is usually directed, however informal learning has seemingly more value			
M.3.12	Use is made of discussions after certain situations have occurred			
P.3.4	Formal forums are used to address certain issues			
R.1.6	The supervisor role assists with the sharing of experiences			
R.3.1	Morning briefings strengthen teamwork			
R.3.2	Use of humour assists with team briefings			
S.3.1	Discussion meetings are often held			
S.3.11	Teamwork and personal stuff can be discussed at work if no controlling work is to be done			

T.3.2	Morning meetings make use of a formal discussion process			
T.3.3	Experiences are shared at morning meetings			
T.3.10	Formal feedback sessions by seniors after attending client meetings			
V.1.10	Training is mainly of a formal nature			
W.2.1	Daily briefings that include aspects of learning from the previous day			
W.2.7	I am confident to stand in front of the team and share my work occurrences			
W.3.3	During training of others own experiences are shared to serve learning purpose			
W.3.6	Occurrences/errors are discussed in a formal manner			
X.3.3	After occurrences discussions are held			
Y.1.14	Everybody can participate in the morning briefings			
Supportive transcript extracts				
When it is formal it is normally forced; its to adhere to policies to keep (organisation's regulator) happy and stuff. Just to have statistics that we do formal learning (L.2.9). *… during morning meetings or when we have a quality circle. If something happened, we will discuss it and the juniors can learn from the seniors and vice versa … (T.3.2).* *… "OK we made a mistake!" It comes up quite frequently that we have that discussion especially when we have an incident (X.3.3).*				
B.3.6	Listening to others	Resourceful-ness	Participative learning (TLB)	Team learning (TL)
G.2.6	Learning from other's actions and experience during an emergency			
I.2.3	You learn from other peoples mistakes			
I.3.6	Learning from others mistakes is beneficial			
J.2.4	You learn more from negative things			

L.2.4	I learn from other people's mistakes and experiences			
N.2.10	I ask instructors			
N.2.9	I learn a lot from incidents			
N.3.1	Learn a lot from emergencies			
V.2.5	I prepare and learn by listening to other controllers			
X.2.10	Uncertainties are addressed by discussing it with others			
Supportive transcript extracts				
And then what I do, is I go to the instructor, actually anybody, and I ask them "listen how would you have done it?" That's how I learned to do things; like that (N.2.10). *There are some of my team mates who I go and listen to what they say, how to act and what to do in certain circumstances. Be it RT or be it practical control or be it just the whole calmness of your voice; everything, stuff like that. I think it's got an influence on that for sure – for the better (V.2.5).*				
B.3.4	Accepting inputs/guidance/help from others	External aided learning	Individual learning orientation (TLC)	Team learning (TL)
C.3.10	Freedom to approach seniors for assistance and confirmation			
S.3.5	People do acknowledge and approach certain persons they consider to be experts			
Supportive transcript extracts				
…so I phoned the CATCO – this was the situation … (explaining the situation; followed by CATCO's explanation). Hey now I know! (C.3.10). *People do approach specific people who they regard as experts, … yes they do … I think some people have got a perception about someone … So, I think … they do … if you work here long enough you know everyone and you know who to ask … they get clever. So they ask certain people about certain stuff (S.3.5).*				

B.3.5	No need to talk about own experiences	Internal directed learning	Individual learning orientation (TLC)	Team learning (TL)
E.2.1	Individual work performance drive dictates learning interests			
E.2.2	I always want to know			
E.2.3	I want to be the best			
K.1.6	Personal aim is to continuously gain experience			
T.2.1	A willingness to learn must exist			
Supportive transcript extracts				
… I always want to know everything and I want to be the best (E.2.1 & E.2.2). *Of course there is superiors and rules are in force, however, because the environment is so that people are happy to work here. I know I have to serve another (period) tour here and I am happy to do it here and gain my experience, (aircraft type) experience (K.1.6).*				
D.2.4	Identify areas for improvement in the team	Design considerations	Training design (TLD)	Team learning (TL)
F.3.8	Leadership influences team learning			
H.2.2	Experience based learning is utilised in future situations			
Y.3.4	Use of practical scenarios by instructors aids learning			
Supportive transcript extracts				
You can identify certain; I won't say problem areas, but areas for improvement in the team (D.2.4). *Because the instructor likes to explain a lot and he likes uses scenarios. And that is practical things that I never got, or never thought about at all (Y.3.4).*				

R.3.9	Formal training responsibility is directed at leadership and members do not always take responsibility for such formal learning	Implementation responsibility	Training implementa-tion (TLE)	Team learning (TL)
Supportive transcript extracts				
… and the first response I got was you must teach us this more; and I said this is not my work to teach you, my work is to teach you (other subjects listed) … (R.3.9).				
C.3.8	Recognising that learning has taken place	Evaluation focus	Training evaluation (TLF)	Team learning (TL)
D.2.3	Assess yourself			
J.3.15	You need to evaluate your own performance in a constructive and objective manner			
J.3.16	There is a positive relationship between learning and performance			
N.2.7	My performance is evaluated by instructors			
Supportive transcript extracts				
You can sit back and reflect on what has happened. You can also assess within yourself what went wrong, what was good, what was not (D.2.3). *So, in that case my performance was a lot better in their eyes, if I can say that (N.2.7).*				
D.3.7	Junior controllers have little groups, confidence groups where discussions take place	Team building	Operational training characteristics (TLG)	Team learning (TL)
L.2.12	Assistance to seniors is provided			
N.2.12	Everybody is willing to help			
N.3.10	Teamwork/team-build session once a year – it is a good thing			
N.3.13	Teamwork and learning is interdependent			

O.3.5	Practical problem-solving exercises to build/strengthen the team are suggested			
O.1.3	Teamwork facilitates communication and restricts misunderstanding			
Q.1.5	People understanding is important within a team			
R.1.16	Teamwork enhancement workshops aid team work and relationships			
R.2.2	When assisting with training in a team, team members gain insight into their influence on human behaviour			
R.3.10	Teams need to be educated in terms of teamwork			
R.3.11	Teamwork enhancement programmes are suggested to enhance teamwork			
T.3.4	Annual teamwork enhancement workshop influences the team positively			
U.3.5	Discussing mistakes brings a team closer together			
V.1.11	Teams see teambuilding as a good thing			
V.1.12	Teams rely on organisational support in team build efforts and are discouraged when let down by the organisation			
V.1.13	Team building addresses personal relationships			
Y.1.3	Ideas are generated at ATC team build workshop			
Y.3.2	Sharing with the team of own experiences is motivated			
Y.3.6	Team building workshops must involve all levels, not just the seniors			
Y.3.8	Team building workshop decisions must be monitored back in the workplace			
Supportive transcript extracts				
There are splinter-groups within the team, splinter-groups but they are good groups. It is the way the junior to put forward what has happened and then to analyse it – because they won't approach senior people – they do not have the confidence to do that (D.3.7). *The only formal thing we do have is at the beginning of the year, we have a weekend where we go out and have a work-function type of thing. It goes over a*				

whole weekend where we discuss specifically what are we going to do, who is in charge of what?, what is our goals?, what do we want to do? – so in that case … it is a very nice thing, it is only once a year, I don't know if we should do it more than once a year, but it is a nice thing - just to get together and build the morale of everybody; its very, very nice (N.3.10). *… what I am trying to say if the approach is collective, it tends to help the team a lot. Last year we went to (ATC workshop/team-build), so we came up with the ideal that OK, controller X do this …(Y.1.3).*				
A.3.1	Learning from experience takes a long time	Learning transmission	Operational training characteristics	Team learning
A.3.2	The only shortcut in learning from experience is the willingness of people with experience to share these experiences			
A.3.3	Story telling is viewed as an effective means to communicate experiences and to ensure learning from experiences			
A.3.5	Discussions are also used to promote learning - these discussions emanate from identified trends or known future events		(TLG)	(TL)
A.3.6	A team needs to do more than (listed items are main learning interventions): de-briefs; formal continuation training events; and written tests in order to have a lasting learning impact			
B.3.12	Briefing information not documented			
C.2.2	On position you learn by asking other controllers			
C.3.4	Learning from someone senior supervising during a shift			
D.3.2	Individuals need to be approachable and open to suggestions			

D.3.3	Discussing different work situations			
D.3.4	Discussions are very, very informal			
D.3.5	Discussion helps one to recall previously learned and not used information			
D.3.8	Informal work-related discussions – discussing what happened during the week is supported and valuable			
F.3.13	Learning by means of workplace interaction is important			
G.3.3	Learning takes place by talking			
H.2.3	Talking about incidents and discussing occurrences			
I.3.5	Seniors share experiences			
O.1.8	Interaction takes place within the workplace			
O.2.5	Understand how others think and reason			
P.2.2	Asking questions to controllers aids learning			
P.2.3	Analysing other controller's periods			
P.3.7	Other points of view are encouraged			
Q.3.5	"and there I was" scenarios are shared			
Q.3.7	Incidents and errors should be discussed in an environment free of victimisation			
U.2.3	I will ask for people's opinions			
U.2.4	I will ask for assistance			
Supportive transcript extracts				
Discussions are very informal, very informal. Between approach controllers they will discuss what happened. It happens a lot of times; especially after a weekend especially when some of the junior oaks were working alone in tower. Then on Monday he will debrief you on what happened the weekend (D.3.4). *… they do this weekends away and stuff – I have never seen this here. Or I don't think they do that. But I think it is by …talking. That is how I think (G.3.3).*				

Experiences are shared with … "and there I was" … experiences we put more in line by … its more by word of mouth (Q.3.5).				
A.2.4	Working within a team allows one to learn and often adapt to others' controlling, coordinating and communication techniques and preferences	Encourage-ment	Operational training characteristics	Team learning
A.3.4	Story telling must be interesting and the spirit of delivery must ensure mutual respect and not only be directive in nature			
C.2.3	Learning is directed by the ever-present safety objective			
C.3.1	Willingness to learn from others with more experience		(TLG)	(TL)
C.3.5	Willingness to learn from others' experiences positively influences team communication			
G.2.4	It is satisfying to teach someone else something			
N.2.13	Respect in interaction is important – personal respect			
R.1.10	A freedom to consult with other experts/sources of knowledge exists			
T.3.5	People are more aware of each other after these workshops			
V.1.2	If people know each other also at a personal level then teamwork may benefit from it			
Supportive transcript extracts				
… especially if you are alone up there to be comfortable enough to phone an approach controller and say … "I don't need you to come out, but I need you to explain to me what to do now, this is my situation" (R.1.10). *… if you know someone here; when I got here (period) ago the people I started to know, my work people, are also sort of your friends. Either if you, you know, like them or not you get to do with them on more than one level, not just at work. You always see them after work or wherever. As you get to know the people, I think when a crisis hits then there is a bit more … teamwork between the people. It is more intense than if you don't know the people as such. That is just on the human emotions part (V.1.2).*				

A.3.24	Spatial distance may negatively impact upon team learning results	Inhibitors	Operational training characteristics (TLG)	Team learning (TL)
G.3.4	Due to status differences participation in potential learning conversations is at times reserved/withheld			
I.1.2	An instructor losing the picture has a negative impact on student learning			
Q.3.10	An openness to discuss work issues is necessary			
Supportive transcript extracts				
Experiences are only discussed in formal training, … I think the people are too afraid of discussing especially … because if you are going to say I really messed up today, you have to be a very positive person to get that forward, before anybody investigates you. I wouldn't say there is an openness, definitely not. It sometimes gets out, for training purposes, … continuation training (Q.3.10).				
B.3.10	Social interaction used to talk about work events	Socialising	Learning environment (TLH)	Team learning (TL)
G.3.12	Social interaction due to status differences is not always easy			
G.3.13	A relaxed environment (such as after-hours) supports informal learning discussions			
J.3.17	Social interaction is adequate but does not play a very important role			
K.3.2	Social interaction at work allows for work discussions			
K.3.6	Socialising do take place as a team			
O.2.8	Work discussions continue at social events			
R.1.15	Team social events contribute to team building			
R.1.18	Social events contribute to a positive team attitude			
S.2.5	You want to interact socially with team members when the team is performing well because you feel closer to them			

S.3.10	Social events allow for discussion of personal and work issues			
T.3.11	Social events help with mutual understanding amongst team members			
U.3.12	At socialising events little work is discussed, which I prefer			
U.3.13	Socialising is good because people get to understand each other better			
U.3.14	Socialising strengthen mutual respect			
V.1.1	You tend to get to know team members outside the workplace			
V.1.8	Social activities strengthens the team			
V.1.9	Social events must be supported by the whole team/all members			
V.3.3	Sharing of experiences is important			
V.3.5	Socialising is important for the team because it brings people closer together			
W.2.11	Social events serve a good team purpose			
W.2.12	Team outcasts/trouble makers are ignored at social functions			
X.2.15	Socialising strengthens the team			
X.2.16	Social interaction leads to being more comfortable with each other and status differences tend to be less prominent as a result of socialising			
Y.2.8	Work is not really discussed at social events			
Y.2.9	Status differences are observed at social events			
Supportive transcript extracts				
You can't do everything as a team. People don't agree; if work is finished then work is finished – I like to mix with the people after-hours as well because that is mostly where you learn or get to know people (G.3.12). *Work experiences are discussed at these events. What we did once is to get (person) to come and work so we could go out and discuss issues, or whatever. It is difficult here because it is not like other bases where there are days that there is not flying ... (S.3.10).*				

Teamwork wise I think there should be more social events, … I am focusing more on social events because that brings people closer together … it doesn't matter if you like someone or not, it is always better than not to do anything social at all. Because I don't think it is happening at all due to some lack of interest. A lack of interest in other, … I will rather say … I will try and take the angle of social events to first get in touch with each other, and then from there on together, work related as well, … to do more formal stuff. I mean if I know I have to go and sit to study on my own for a test tomorrow it has got to be worth then if I have one of my friends that can study with me but we know that we got to do this thing together. So, it is obviously going to be more of a bit of motivational … if I know that I will do it the right way (V.3.5).				
A.2.9	A concerted effort/intent exists in terms of capturing workplace-related learning events into SOPs for reference in future (future teams) – thus ensuring the survival of the team output, although it may not be the same team members in future This assists in re-learning and new learning of past experiences	Involvement	Learning environment (TLH)	Team learning (TL)
B.3.2	Learn through others' experiences			
B.3.3	Asking others if understanding does not prevail			
N.3.6	Formal training days are used to revisit theory			
S.3.2	Examples and experiences are shared			
S.3.3	Errors are recorded/documented			
S.3.4	Experience and knowledge are shared			
T.2.6	A freedom exists to approach people who differ from you for further explanations			
U.3.6	Experiences are shared during briefings			
W.3.2	Willingness to obtain and share experiences			
Supportive transcript extracts				
With their experiences we learnt how to work with them, how to handle them. … if something happened we ask (B.3.3).				

So that if someone is not there in the meeting he can go and read it afterwards and also know about it. It is important to share your experiences and knowledge, especially in our environment situations repeat each other. So, next time someone can be slightly more prepared than you were … which can also help (S.3.4). … its not because I have a lot of say, its because I say the things I want to say. But I don't think with my experiences … because I don't see myself as one with a lot of experiences being at this unit for the last so many years. But I can speak to people that has had (aircraft type) in their circuit and things like that (W.3.2).

D.1.5	Good teamwork assists with controller training	Dynamics	Learning environment (TLH)	Team learning (TL)
N.2.3	Standard of instruction maintained amongst all instructors			
N.2.11	Learn by continuously practicing			
O.2.3	Status difference did not influence learning			
O.3.4	More teamwork sessions are required to function better			
P.3.5	Teamwork need to motivated by seniors			
R.1.17	Not all team members are willing to spend time with the team after hours			
T.2.2	In a team you view experiences through the eyes of others			
T.3.1	Learning takes place by experience and experience examples			
U.3.4	Learning helps to improve controlling abilities and working together			

Supportive transcript extracts

But unfortunately you also get members in the group that does not want to spend time with the rest of the guys because they feel it is their time, … it is the only time that they have with their families and now they have to spend it with members that they actually don't want to. So yes I feel it is a good thing, it does the guys good, they feel good, but unfortunately … (R.1.17).

Obviously when I first arrived here, I wouldn't say I was a totally different person, but as my experience grew I sort of adopted, not principles … I don't know the right word … from other team members … and I would say it influences your personality as positively. You get in contact with other types of personalities and maybe see things through their eyes and not necessarily what you think was the only way of doing things … you get to learn from others and see things through

their perspective. That itself, I think is positive, towards teamwork in general (T.2.2).				
F.3.9	Learning requires a supportive mutual respect directed environment	Facilitation considerations	Team learning facilitation (TLI)	Team learning (TL)
I.2.9	Remedial action with a person who has made a mistake is done away from others			
K.2.4	Team members may be natural ATCs or experienced ATCs – this impacts on the team's performance			
K.3.4	A relaxed environment exists that fosters work conversations			
L.1.5	The atmosphere must never become too relaxed			
Q.2.1	Differences in cognition of team members influence individual learning			
R.3.12	Leadership and team expectations need to be communicated and familiar to the team			
X.2.11	Approaching seniors for advice is done with caution			
X.2.12	I need to be comfortable with the members that I approach for advice			
Y.2.7	Understanding others in the team contributes towards being a part of the team			
Supportive transcript extracts				
For myself, from my past experience sometimes yourself as an individual you work faster than other people … you sometimes forget about that people are a bit slower than you are, and you may be the more advanced; I am not saying am more. You tend to forget that people are not the same , especially when you give instruction … (Q.2.1). *… because sometimes … and that is not what is happening here, … in general that is what I find … is that the group does not understand what the leader expect from them, so it is like … grabbing here and grabbing there … and nobody really understands what is expected (R.3.12).*				
D.3.1	Learning improves teamwork and teamwork improves the service	Value	Team learning facilitation	Team learning
F.2.4	Openness/freedom to discuss work problems with colleagues			

I.3.8	Remedial action is freely shared/stated		(TLI)	(TL)
J.3.5	Learn from seniors			
N.3.7	Occurrences are documented in the quality circle book			
N.3.8	Red tag system is used to maintain standards			
N.3.9	Revisiting documented information takes place			
T.1.9	Team members embark on coaching efforts			
T.1.10	Team members don't feel threatened to discuss work issues with seniors			
U.3.7	Experts in the team are identified and approached when required			
V.2.1	Role models exist within a team			
V.2.14	Resources with a lot of knowledge are in the team			
W.3.7	Experts in the team are consulted by members			
Y.3.3	Seniors like to share experiences			

Supportive transcript extracts

We have got a red tag file specifically … we will show them … we will write in and you have to read it and sign it, all of us. So, in that case we all know this is now the set standard; this is what is serviceable, this is what is not (N.3.8).

The experienced guys .. I'll say with extra coaching especially in their initial validation phase, I'll say extra coaching and maybe extra lectures and maybe an extension on hours needed to validate. I think this … the CATCO has got an open-door policy and as well as the seniors in the tower … what I have found is the students … they came out of themselves and approached the seniors (T.1.9).

If there is one thing that they love it is when a junior asks a senior to help you with something, to share his experience. I can mention a lot of them. For instance they love to share their experience …"when I was in this place and that place …". It does help a lot … (Y.3.3).

Compiled by the researcher

Table 5.10 Results: Impact of teamwork on air traffic control workplace performance outcomes

Alpha-numerical codes	Summary of narrative codes derived from actual statements	Descriptive key terms	Subcategories	Categories
A.1.2	Team members fulfil team roles	Team roles	Team work characteristics (TMA)	Team performance (TP)
A.3.14	Breakdowns in team plans/performance can be the result of different team roles (controller positions) where one controller perceives the other as more important			
F.1.2	Understanding work roles and their influence is important			
G.1.4	Team roles are not only ATC-focused but also supportive (admin) roles are fulfilled			
L.2.7	Other roles need to be fulfilled (non-controlling like admin)			
N.1.3	Other tasks need to be performed that support the team			
P.1.1	Teamwork supports the different ATC positions			
A.1.2	Team members fulfil team roles			
Supportive transcript extracts				
Each guy has a very defined role to play in the team (A.1.2). *The same with the coordination between approach, ground and tower and how they influence each other in the actual flow of air traffic as it may be. It has a great influence on the outcome of the whole, call it, flying safety as well as the actual flow of air traffic et cetera (F.1.2).* *Other types of things – you are the junior you have to sort out the (administrative tasks). I don't expect the (higher rank) to do it because he has got things on his hands that I am not capable of doing yet (L.2.7).*				

A.2.7	Team leadership is not dictatorship	Power base	Team work characteristics (TMA)	Team performance (TP)
R.1.1	Understanding of each others' roles is essential for good teamwork			
O.2.11	Team members require leadership support			
R.2.9	Team leader deals with negativity issues primarily			
X.3.4	The need for someone to stand up for the team is voiced			
Supportive transcript extracts				
… being a Chief Air Traffic Control Officer is not a dictatorship (A.2.7). *The Chief Air Traffic Control Officer is our manager, section head, so we refer to him if I detect or any of the other members confront me that there is another member with negativity. So, we usually follow the route via the Chief Air Traffic Control Officer (O.2.11).*				
A.3.13	New team members often think of their own individual role and not of the team's function	Individual focal point	Team work characteristics (TMA)	Team performance (TP)
G.3.6	You must know your job and you must stick to your guns			
G.3.15	You cannot always change other people, you have to change yourself			
H.2.8	The service that you provide needs to match the team's level of service delivery			
I.3.3	Team knows of my difficulties			
M.3.1	You have to be willing to practise to be/strive to be perfect			
M.3.11	When you work you work as an individual			
O.2.9	Personal issues are observed/sensed and then discussed with the member(s) concerned			
P.1.10	Individual confidence is an important trait in ATC			
Q.2.3	People without experience force the team towards an individualistic work approach and do not support the collective effort			

S.1.2	Personal issues should not influence work			
V.2.8	Home/personal issues influence teamwork			
X.3.7	You have to get yourself out of your negative mindset			
Supportive transcript extracts				
You must feel confident that if you make a decision and something queries you or someone queries you - you must be able to say "no", "I will stick to my point or decision because of…" (G.3.6). *… he or she first has to think and make a plan to fit this traffic into his existing pattern, which creates a bit of delays and time to think about what to do with the guy also does not display a lot of confidence in abilities towards the pilot which I feel is essential (P.1.10).* *You know that you cannot become negative because you have a license to protect. It is you work it is your job, this is what you do. So somehow, you get yourself out of that mindset, … you, yourself (X.3.7).*				
A.3.16	In an ATC team one cannot only think of oneself and forget the team	Synergy	Team work characteristics (TMA)	Team performance (TP)
A.3.22	Fellow-controllers need to at an early stage emphasise and reinforce that members are all part of a team			
D.1.6	Common effort to provide a good service despite limited individual experiences			
H.3.2	Incidents (not the member's mistake) strengthen the team against outside attacks			
J.1.5	Rely on other people to assist			
J.1.11	Everybody has to be part of the team			
J.3.1	Once you qualify you are welcomed as part of the team			
L.3.5	Standing together against outside threats strengthens the team			
M.1.3	We understand each other			
N.3.14	Teamwork builds camaraderie			

S.3.12	An ATC team requires team persons			
S.3.13	People who do not fit into the team will eventually conform			
S.3.14	New members may take time to fit into the team			
T.1.7	Teamwork leads to esprit de corps			
W.1.5	Effective teams create a sense of pride and belongingness			
Y.1.1	A collective and effective approach is required			
Supportive transcript extracts				
You need to understand and people need to point out from a very early stage that you are part of the team (A.3.22). *Whether is it the ATSA printing the strips or the approach controller clearing an aircraft on the ILS … everybody has to be part of that team (J.1.11).* *So, if you work together as a team, a good team, … I mean eventually it is teamwork, I mean it is good or not good. When it is a good team working we sometimes call them, jokingly, the A-team (W.1.5).*				
C.1.7	Relations with fellow team members can be good or not so good and these relationships influence cooperation accordingly	Team relationships	Team work characteristics	Team performance
E.3.8	You must know your stuff before you can work successfully with others			
H.2.7	You must show interest in other people		(TMA)	(TP)
H.1.4	No negative feelings			
O.1.7	Unit's team is described as a close-knit family			
P.2.6	Sharing and displaying interest strengthens relationships			
Q.1.1	Good relationships within a team contribute to a good service			
S.2.8	Personal relationships are important for teamwork			
U.1.3	People who have a good relationship and mutual understanding elect to work together			

X.2.1	Preferences to work with certain team members are expressed			
Supportive transcript extracts				
And all depends on who you are working with, because if you have good relations with someone … then you are open to things; … rather than I am not too comfortable working with this guy so I am not going to bog him unnecessary or ask him this or that – he may just come down on me. But with someone else then you feel comfortable with the person then you will - "sure you go for it, I have no objections provided so and so" (C.1.7). *The team at this unit is a very close knit, how can I put it … team (O.1.7).* *So, I mean you must make maatjies and like each other to get through your days and years, or whatever, because I mean its not ideal work circumstances that we have got. Its small spaces and lots of people (S.2.8).*				
E.1.7	Information and experience sharing takes place continuously	Experience	Team work characteristics (TMA)	Team performance (TP)
E.3.4	Sharing of experiences take place daily			
Q.3.1	Experience is important if objectives need to be achieved			
Supportive transcript extracts				
Because there is obviously the people with more experience have got more knowledge – which have to be taken down to the junior people as well. It happens, every single day. It is obvious things actually; somebody that knows their airspace very well, the aircraft performance maybe (E.1.7). *OK, obviously if you are a more experienced person and you work in a team and your team are able to listen to you; you can either be the leader or one of the followers – but I think you definitely need experience to achieve your objectives. I mean you can have the knowledge and not the experience, you will not be able to do it, it will take you much more longer (Q.3.1).*				
G.1.6	Members can call on each other for assistance	Team assistance	Team work characteristics (TMA)	Team performance (TP)
G.2.7	Controllers voluntarily provide assistance during an emergency situation			
G.1.7	Assistance opportunities may not be abused			

H.3.3	Incidents (the member's mistake) create opportunities for intra-team support and assistance to the member involved			
H.3.6	Willingness to correct each other			
I.2.2	Team members helped me and supported me to be more comfortable			
I.3.2	Approach others for assistance			
M.3.8	After absence from work the team ensures that you are brought on par first			
R.1.14	Team members must illustrate that they will ask for assistance when required before such members will be trusted by the team			
S.1.5	Support in terms of diversity is also important			
S.1.8	Teamwork is also supporting one another			
V.1.6	Team members look out for one another			
Supportive transcript extracts				
… it depends on the request. You must not then assume that because there is a lot of people sitting downstairs you can just call because you can't sit or you don't want to sit. Then it tends to get, …it must really be something that cannot prevent you from doing your controlling for that two hours (G.1.7). *I have met quite a few friends here and other people I know which is people but it is not your friends. So, it could have been; I can't actually remember exactly who; but it could of have been my best friend and my other best friend that were coincidently on their different positions and that we were looking out more for each other than for instance just doing your job. I don't know … I think it is just that they knew we were in a difficult situation concerning our (resources) and the people just went out to help as far as they could. I think in normal circumstances it would be like that in any case (V.1.6).*				
H.3.5	Constructive feedback and assistance is provided by seniors	Teamwork criticism	Team work characteristics (TMA)	Team performance (TP)
V.2.3	Controllers critique each other's work			

Supportive transcript extracts				
But also I know for instance that the senior controllers will always try and help you when they give constructive criticism if needed they will never try to down-grade your controlling; they try and help you as far as possible in a good way (H.3.5). *Say for instance at (another ATSU) I saw that everybody was sitting upstairs listening out on the frequency that the controller was controlling on and as soon as one of the people make a mistake or whatever, everyone is there to listen out on that frequency, so everyone is quick to jump on the wagon and say "this and this". But as soon as they go and sit there they all of sudden know that they are also exposed as well (V.2.3).*				
G.2.1	Freedom to express uncertainty	Conformity pressures	Team work characteristics (TMA)	Team performance (TP)
H.1.6	There is a willingness to work			
K.2.2	Individuals expect reward from teamwork			
Y.2.4	Interest in what you are doing is valuable			
V.2.9	Members are irritated when there is no controlling work			
J.1.14	Personality differences do influence teamwork			
L.1.8	New people have to prove themselves in order to gain team acceptance			
L.1.10	Stress is caused by tempers that in turn negatively influence teamwork			
L.2.5	Found it easy to fit in because I knew my place			
M.2.5	Pressure on the team leads to better team performance			
P.1.2	Inadequate teamwork leads to poor controlling			
P.3.6	Slip-ups must be dealt with diplomatically- we are very touchy people			
Q.1.7	Each member in the team must be able to handle pressure – if not the team effort suffers			
Q.2.4	Involvement of people in team projects allows for better team results			
R.1.13	Teams hardships and the past are regarded as important			

R.2.1	The team does not automatically accept newcomers			
T.1.2	Teams consist of people sharing a passion, interest			
T.1.3	Good teamwork makes the team efficient			
W.1.4	Newcomers need to adapt to the team's way of doing things			
W.2.13	Newcomers to the team find it difficult to change the team, normally the newcomers eventually adapt to the team			
X.2.7	You have to remain in practice to ensure competence			
Supportive transcript extracts				
Say for instance when a new person arrives at the tower … you first have to get to know that person to know what he means when he says something … exactly how he expresses himself. Everybody is a bit guarded when any new person enters the tower because the team is so closely knit. As the people open that teamwork element opens up (L.1.8). *I have always liked to see myself being art of a team and … like I said to you the first time … I believe that when you are on a team the performance, when it starts getting more hectic or more pressure gets put on you, you start performing better in a team (M.2.5).* *(Person) coming from (another ATSU) and with (another person) and they have to adapt to the (this ATSU) intensity and how we speak to each other here. We, if I with (another person) I'll just press the intercom and say "yours" and he will know exactly who, where, what and when … it is one word (W.1.4).*				
E.1.1	Work environment dictates teamwork	Teamwork environment	Team work characteristics (TMA)	Team performance (TP)
K.1.4	The environment is comfortable and supportive			
K.1.5	Teamwork creates a calm and relaxed environment			
S.1.3	A happy environment must prevail			
Supportive transcript extracts				
It is a relaxed environment and authority is still there and I think … it is the best way I can explain it … be comfortable, trust each other, rely on each other and				

therefore we can have a good influence on ATC. Either way it goes, from tower to approach, from tower to ground (K.1.4). *I think also, keeping each other happy … your work environment must be happy, you must feel no threats or vibes between people (S.1.3).*				
G.3.5	Status differences do not impact on your work performance	Status influences	Team work characteristics (TMA)	Team performance (TP)
L.2.10	Status differences do not impact on learning			
R.1.11	Status differences do appear to influence teamwork			
V.2.7	Status differences can negatively impact teamwork			
W.1.6	Teamwork breakdowns may be the result of status differences			
W.1.7	Control positions are emphasised rather than the status of the person occupying the position at the time			
W.1.8	Controllers should not budge easily in terms of status influence			
Supportive transcript extracts				
But I think it is a personal thing - doesn't matter of your rank, doesn't matter who you are if you take control of your two hours its yours (G.3.5) *I think rank is sometimes a very difficult thing to be comfortable with, … but that is part of the military unfortunately … (R.1.11).* *… I don't care if it is a (higher rank) sitting down at approach, … if he doesn't have the picture of what is going on in my circuit, he cannot force me …luckily I am one of those people who don't budge easily, I know that I am working with my license. I do believe that the rank structure mostly, … and the fact that under our (number of higher ranks) that we have and even still today after these guys have been transferred in … are struggling to sort each other out; fighting still for their place in the whole structure (W.1.8).*				
A.1.6	Information is drawn from whoever is the strongest in that specific expertise level	Learning	Team work characteristics	Team performance
A.3.25	Controllers fulfilling different roles and that have different levels of experience need interact in order to strengthen the team and to enhance learning			

E.1.6	Strong practical/experience based requirement in the workplace		(TMA)	(TP)
N.3.12	Humour is used in learning			
O.2.4	Learn by observations			
P.2.1	Learn by observing other controllers at work			
Supportive transcript extracts				
They will explain it to the person and from there the person will learn. Obviously a very much, … experience – there is a very big learning curve from experience. It is the same as theory; you still have got your theory basics but it is not the practical things. When you do it practically then it is not quite same as the theory. You still have the basics yes, but you still have got to do the practical phase (E.1.6). *(Further ATC scenarios stated and sometimes people mock him for his actions) – It doesn't hamper professionalism it hasn't bothered me; it is a good thing, it take builds like morale – everybody laughs and stuff; and laughter is the best medicine. I wipe it off my back, I don't have hassles, it is building camaraderie. If you it seriously then there is something wrong (N.3.12).* *I basically just pay attention to other controllers when they are controlling. Not to do fault-finding or anything, but to learn from the way other people do it (P.2.1).*				
G.3.19	Personal differences must be addressed	Team conflict	Team work characteristics (TMA)	Team performance (TP)
J.1.13	It is necessary to address the role/position not the person			
J.3.8	Forced ideas are not readily accepted/supported			
J.3.9	Another problem – I am better than you!			
N.3.11	Freedom to confront each other regarding work issues			
Q.2.8	Personality clashes are detrimental to teamwork			
Q.2.9	Individuals may avoid each other due to differences			
Q.3.8	Corrective/remedial actions should be performed in a constructive manner			

Q.3.9	Fellow team members need to be observed in order to ensure that the team effort and objective is achieved			
Q.3.12	There should not be any doubt about a fellow team member's experience			
Q.3.13	Senior team members must be experienced to fulfil the senior roles			
R.1.2	Understanding of team roles helps to reduce personality clashes			
R.1.3	When team members feel they still have to prove themselves this can have a negative impact on team performance			
R.1.4	People who do not get along on a personal level have difficulty accepting criticism from one another			
R.1.7	Supervisor role helps to alleviate/address conflict amongst team members			
T.2.7	Conflict in a team is managed by means of conversation/discussion after an occurrence			
U.1.1	Conflicts that are not addressed/managed in an effective manner impact negatively on team performance			
U.1.2	People with differences/conflict choose not to work together on shift			
V.2.6	Conflict can have a negative impact			
W.1.9	Senior members may attempt to divide the team to benefit those senior members – thus creating tension			
W.1.11	Tension in the work place is the result of people's mixed emotions, tempers rising, poor concentration			
W.1.12	Conflict is managed in a mature manner by discussion			
R.1.8	Victimisation is reduced by the supervisor presence and activities			
Y.1.4	Sarcasm in the team is not good			

Y.1.9	Spitefulness does not do any good for a team			
Supportive transcript extracts				
Rather than like helping that person, and saying –"this is what is going on, lets sit together and I will show you how to do it, and you can do it on your own". The approach is, I would say, is totally wrong, definitely; it is not just spoon-feed everybody but not everybody tends to understand something in exactly the same way (Q.3.8). *What I have experienced here before was, when working on a certain position and, it has happened to me, where you have a conflict with one of the people working at a different position … it became to such an extent that the person jumped up from that position and came over to me and was shouting at me and then went back to his position. And then obviously after that you don't feel the same any more … you are not providing the same service any more …you are not concentrating any more, because now you are upset about what happened and when it comes to the coordination then the coordination is not what it should be, so the job don't get done the way it should get done, because of the conflict between you and the person or whoever. At that time it had definitely an effect on my controlling and an effect on the other person's controlling as well … that's on the negative side of things (U.1.1).* *I think it is difficult, in my opinion, most of the ATCs all have strong personalities. They tend to clash, whenever you take someone on they will take you back on, no one likes to be tapped over their fingers obviously, except if it is by the boss, then you will say "yes sir". If anyone else takes you on if you feel you have a point to stand on then there is strong personality clashes (V.2.6).*				
A.1.7	Team members have different backgrounds and these background differences are acknowledged and utilised to better team performances	Diversity	Team work characteristics	Team performance
P.3.9	Diversity in a team improves the teamwork			
Q.1.8	Workplace diversity issues require attention		(TMA)	(TP)
R.1.12	Diversity is managed to the benefit of all			
X.2.13	Lack of diverse sensitivity does not influence the work output			
X.2.14	Survival in terms of diversity at a personal level requires adaptation			

Supportive transcript extracts				
I think the diversity of the team improves teamwork quite a bit … I think it has a huge impact on the quality of teamwork, because if, … taking myself … if I didn't have the freedom to address which I perceive as a fault or a problem on a senior controller's side being rank or controller wise, then that input will never be put on the table, it will never be discussed, it will never be implemented or changes made to the process or to how things are done (P.3.9). *… what is definitely a shortcoming is people converging them, basically working together is the black personnel, which I am not criticising at all, it is actually a great bunch of people here, but they don't actually feel part of the group at all. Now I don't know if it is a cultural diversity or something else, but they are more bothered with each other than with the rest of the crew that is not of the same colour (Q.1.8).* *We work together quite nicely but socialising I think we are not adapting to each other; you can still see the coloureds here, the black people here and the white people here. It's a mazed-out situation wherever we go. I don't think it has an influence on the ATC service that we provide … because of the way that we work together, I get along quite well with them here but socially I prefer to be on my side, but in work I adapt and I work with them well together. I think they adapt as well. At work we are fine (X.2.13).*				
A.3.8	Team work problems mainly occur at the communication and coordinating interfaces between people	Teamwork problems	Team work characteristics	Team performance
G.1.3	Unresolved errors can be transferred, creating an escalating problem			
I.3.9	Perceived personal favouritism has a negative team impact		(TMA)	(TP)
I.3.10	Cynical comments do sometimes surface			
Q.1.6	Shifting of blame in a team is a shortcoming			
R.2.7	Sensitivity by the team members in terms of feedback provided is observed			
R.2.8	Work occurrences are not always discussed due to fear of negative repercussions			
T.1.6	Negative influences in a team may be culture and personality differences			
W.2.14	The team does not appreciate taking in someone who is going to harm the team			

W.2.15	This team has unpopular members but the team has a way of dealing with them			
W.3.14	Perceived stupidity of team members is not tolerated			
X.1.5	Assumptions in ATC are not supported			
X.2.17	The team dealt with people who misbehaved or experienced problems			
X.3.5	Team becomes negative if error disparity is evident			
X.3.6	Negativity is not allowed by individuals because it impacts on your own responsibility levels			
Supportive transcript extracts				
… maybe people are under pressure, they like more eager to put the blame on somebody else; other words if they had a bad day they get influenced to make it more miserable to other people as well. Then you can't work as a team (Q.1.6). *Negative points that might influence the outcome of the service we provide is personality clashes although we have more or less the same passion and more or less the same personality there will be personality clashes. We have different cultures in our team so ... besides that I cannot think of any other negative things (T.1.6).* *… it was not a problem but the next day in the briefing the CATCO made it clear that you've got to stipulate in saying, you can't assume that "it doesn't matter to me" - for that student in the aircraft it is a problem (X.1.5).*				
A.1.1	Individual's realisation of teamwork	Team member focus	Self-efficacy	Team performance
A.3.18	Younger/new controllers are restricted in their thoughts – they think ATC (individual focus) and not ATM (team focus)			
G.1.9	Never rely on someone else to back you up, they will not be there when you are working alone		(TMB)	(TP)
Supportive transcript extracts				
We obviously know that it is a team and it has to operate as a team - it is the only way (A.1.1).				

You must never rely on someone else to back you up. If you can do something to improve yourself which will make the team better you must do that also. Otherwise you are just going to depend on other people to do the job and you are just going to sit behind, then get behind as well (G.1.9).				
C.1.1	Dependency on each other (controllers and control positions)	Collective focus	Self-efficacy (TMB)	Team performance (TP)
S.2.6	Teamwork forces a move from you, as individual, to the team (collective)			
V.1.4	In difficult work situations team members support each other proactively			
Supportive transcript extracts				
If you work in a team you must learn to … you are not number one any more I mean if you work for yourself you must now step back and think for fifteen people and not for one. I mean I cannot come to work and say lets do this and this … you must now think …"will this person want to do this and this?" So, you must … your thoughts must change, it is not just you … you must … it is not going to affect you it is going to affect 15 other people. So you must stop thinking about yourself; actually you can't think about yourself in that sense (S.2.6). *OK it was just the fast organising of everything. They got the people out even before we could double-check or if some of the stuff was done, it was already done. And you know that as soon as you call on someone, it has already been done; "don't worry can I help you with something else?" (V.1.4).*				
C.1.6	The deciding factor is safety	Safety concerns	Teamwork activities (TMC)	Team performance (TP)
E.1.2	Safety objective stated			
F.1.4	Coordination supports the team objective - safety			
G.1.1	Common team objective is aircraft safety			
I.1.1	Teamwork positively influences the ATC objective			
J.1.4	Cooperation is essential for safety			
N.1.8	It all goes about flight safety			
O.1.2	Safe orderly flow of traffic			

S.1.4	Safety focus is important			
Y.1.11	Safety focused			
Supportive transcript extracts				
Obviously it is teamwork because you have to work together to get the aircraft safely in the air as well as on the ground (E.1.2). *Basically, if you have got good teamwork you can make the air traffic flow in a positive way and timely fashion (I.1.1).* *… I mean there mustn't be vibes and stuff , you must all make each other happy to have a safe flying environment (S.1.4).*				
A.1.3	Strengths of team members are known and resources are utilised accordingly	Team planning	Teamwork activities (TMC)	Team performance (TP)
A.3.17	Review of team plans relies upon input (verbal) from the team member that is experiencing difficulty during a work period at that that stage			
A.2.3	Depending on the other controller's actions, one needs to be flexible to change own plans			
C.1.3	One decision influences the quality of the next controller's decision			
H.3.4	People and processes change			
J.1.6	Teamwork relies upon a systems work approach			
J.1.8	Activities are interrelated and dependent on one another			
N.1.6	Controllers are willing to change their plan to accommodate your requests			
Q.2.5	Teamwork allows for better work distribution			
R.1.5	The use of team supervisors assists with teamwork and team performance			
R.1.9	Work processes are aligned to support teamwork			
Supportive transcript extracts				
One of the roles is to tell me when it is getting too much. You need to tell me, you need to understand that it is your role and that it is not a personal issue, the traffic plan is not working (A.3.17).				

If I need some help over here, say now a guy is flying (ATC procedure described) … then approach is more than happy to help me out in that case – that is good teamwork I reckon. And you know … it always happens that they will help me out (N.1.6). *… used one of our personnel to reduce the workload, but actually got shifted away from you it is worries that is taken away. So, definitely to get more team members involved … qualified members … you will definitely get all the workloads, … much of it will be, how can I put it … spread more evenly(Q.2.5).*				
A.1.9	Customer service relies upon experience sharing and experience sharing shapes the quality of service delivery	Team outputs	Teamwork activities	Team performance
B.1.5	Professional service relies on teamwork			
D.1.4	Professional focus maintained		(TMC)	(TP)
G.1.8	You must ensure that you are fit and capable to do your job			
H.1.7	People want to work and assist/contribute			
H.1.8	Service is not hampered by physical distance between controller stations			
K.1.10	It is important not to compromise professionalism for friendliness			
K.2.1	Individuals strive towards higher standards at the individual and collective levels			
K.3.5	Despite team differences we all share common goals			
M.1.2	Work has priority			
N.1.7	A need to portray an image of good teamwork			
O.2.10	Negativity is sensed but it does not influence the team's outcome			
O.3.3	It is an integral part of teamwork to improve service			
P.1.3	Everybody is working towards a better service			
V.2.2	You always strive to be professional			
W.1.1	When control positions work effectively together then service delivery is more effective			

W.3.1	All team members share in the teams responsibility			
W.3.4	Team members need to check and check again what they are doing			
W.3.5	Team members must make doubly sure that what they are doing is correct			
W.3.13	Team members cannot be fearful of the work			
Supportive transcript extracts				
Professionalism is expected – you need to do your job as trained, even better. He must strive to do his utmost, his best, be professional. Thus enabling the approach controller, which ever person, or in team context, to do their best – thus performing at 110% (D.1.4). *OK, you get two ways – the bad way – the team can be substandard and you are working above the teamwork and sometimes that is frustrating because if you are juniors … you are working at a standard that just reaches the bare minimum, but you want to work at a standard that achieves maximum professionalism, effort and get reward out of that – with you appreciating the reward (K.2.1).* *Basically on a daily basis your teamwork … who is doing … everybody knows what is going on elsewhere and therefore can provide a better service(P.1.3).*				
A.3.23	Spatial distance in the workplace tends to create an us and them scenario that is not favourable for teamwork	Team coordination	Teamwork activities	Team performance
D.1.1	Teamwork is a day-to-day constant working relationship			
I.1.3	Controllers at times ignore the intercom, making coordination difficult		(TMC)	(TP)
W.1.2	Coordination between positions is essential			
X.1.1	Coordination plays a big role in teamwork			
Supportive transcript extracts				
Positive way; if you want to contact the approach controller when they are sitting downstairs, especially now the last time that the (aircraft type) was here and trying to get departure clearances or basically just to tell them something has started and sometimes they ignored us. Especially the ground controller because according to them the aircraft is safe on the ground and doesn't have a problem; it is only when it becomes airborne that it becomes a problem. You know, so				

what they sometimes did was ignore the intercom system and aircraft had to be delayed due to this (I.1.3). *… because sometimes you work with a guy, when (person) just came here and what I saw now when I went to (another ATSU) the teamwork there is absolutely like there is no coordination between approach and them, approach just dumps aircraft (W.1.2).*				
B.1.1	People voluntarily assist to fulfil vacant needed team roles	Duty responsibility	Teamwork activities (TMC)	Team performance (TP)
B.2.4	Pushing oneself to be better			
B.2.8	Ability to multi-task is important			
E.1.4	Picking up mistakes and correcting them is essential			
M.2.7	You always want to be professional in the service that you provide			
M.3.7	You can rely on support from others/supervisor			
N.1.1	Everyone likes to be part of the action			
N.1.4	I am free to ask for assistance and receive it			
P.1.6	Realisation by all of the importance to comply with ATC taught practices/rules			
P.3.2	On position the controller accepts all responsibility irrespective of status			
R.3.13	Team objectives must belong to the team, not simply following meaningless organisation objectives			
R.3.14	Realistic team objectives supports effective teamwork			
S.1.7	Business as a controller forces you to focus on the work			
T.1.1	Teamwork emphasises efforts to achieve a common goal			
T.1.4	Teams realise that errors can be made and are aware thereof			
U.1.5	Teamwork is essential for ATC			
U.3.15	The work is always bigger/more important than the personal conflict issues			

V.1.3	Effective team members know their procedures and work			
W.3.16	You must have the maturity and freedom to confront others and the situation			
Y.1.6	You are ultimately responsible for what happens when you control and controllers take this responsibility seriously			
Supportive transcript extracts				
We have controlling positions, there might be a (junior rank) on a senior controlling position or any controlling position for that matter and he is in charge of that position and he has got nobody else who's got any say unless he screws up (P.3.2). *… the juniors saying at the end of this year I want to be … (examples stated) … and everybody knows and works together towards those objectives; because the moment you have common objectives that is important to everybody and not to the system … I think that is more effective (R.3.14).* *… when you are a tower controller, you are in charge in the tower there, so they are good … it's that guy's life. Obviously during emergencies you break all the rules, but the point is when you are a tower controller you are in charge, even if there is a senior controller in the tower and they are distracting you … "excuse me (senior ranks) I can't focus here, do you mind going downstairs?" (Y.1.6).*				
E.1.5	In correcting errors you may need to approach a colleague	Team communication	Teamwork activities (TMC)	Team performance (TP)
E.1.9	Controllers do not accept unclear situations – they will ask for clarification			
E.2.5	Questioning work procedures			
E.2.6	Clarify uncertainties and a freedom to ask for clarification			
E.3.1	Controllers are expected to trouble-shoot each other's controlling while on shift			
F.3.6	Innovative solutions are shared, however, not very often			
I.2.4	People will tell you if you made a mistake			
J.3.6	Unwillingness to share leads to isolation of the team – being pushed out			
M.1.7	You are well tuned to other controllers – what they are doing			

M.1.8	When very busy information may get lost			
X.1.4	People differ in the manner that they communicate (phraseology)			
X.1.9	Controllers are willing to ask for assistance when controlling			
Supportive transcript extracts				
Innovative things are shared, sometimes they would come up with things that they have learned and things that have happened and was handled in a positive way. They would come up and say – I have found that this actually works for me in this period; that type of thing and there would be a discussion about it. It is not something that happens often (F.3.6). *… I have noticed that the team tend to isolate them, they tend to push them out … you do get this feeling that this person thinks he is better than we are, they don't want to speak to us about it, … and you do have people with a lot of experience that uses it as a power-base. I think that they think that sharing this information will do something to them, their ability to control the people around them, they use it as a form of authority … this information. Or alternatively I think they are just spiteful; there are a few of them and they are out there, but they are very strange (J.3.6).* *Most people say something that is not really unnecessary for instance if there is an aircraft coming into the ATZ for instance, then some people say (different RT phrases by different controllers) – you maybe will see that it is not necessary and the other person will see it as necessary (X.1.4).*				
I.1.5	Geographical separation not viewed as a major problem	Team's work processes	Teamwork activities (TMC)	Team performance (TP)
J.1.2	ATCs from other units are used when situations dictate			
J.3.3	Team members can bring the team apart or break the team up			
K.1.1	Teamwork supports the various ATC functions			
L.1.1	Teamwork supports the various ATC functions			
L.3.6	Transforming the ATC work environment requires teamwork			
M.1.1	Teamwork supports the various ATC functions			
N.1.5	There is a relationship between control positions			

O.1.1	Teamwork supports the different ATC positions			
O.2.2	Team members are encouraged to be open-minded			
P.2.10	You must not try to interfere in another controller's work			
Q.1.3	Cliques may be dangerous to a team – in cliques the focus is on the person primarily and secondarily on the work			
X.2.2	People transferred into the team may have different controlling styles			
Y.3.1	This requires from you to be flexible in controlling			
Supportive transcript extracts				
Air traffic control is simple, area, approach, the tower and there is the ground controller. Well, first of all if you don't work as a team, for example the tower controller … (K.1.1). *Teamwork is really important. You have to work in a team because … like the coordination between ground control, the ATSA, tower and approach control positions. There has to be a close-knit team in order for the whole system to work properly (L.1.1).* *Teamwork is very important because it is a very interactive work that we do. We have got four positions that you work with, as you probably know, it is ATSA, ground control, if we have, tower control, approach and then also GCA. All of those positions constantly have to understand each other and know what is happening in a situation that they find themselves in at that moment (M.1.1).*				
M.2.3	Supervisor available to assist	Supervision activities	Teamwork activities (TMC)	Team performance (TP)
M.2.4	Supervisor will intervene when required and that is accepted			
X.1.8	Presence of the supervisor may be daunting but it is also a soundboard			
Y.1.2	Supervisors provide advice			
Y.1.8	The supervisor role is advisory			

Supportive transcript extracts				
The SATCO is a non-controlling position, that person is rostered and will only influence your work when they start seeing that you loose the picture and, or either you cannot handle the amount of traffic that is on you at the moment and then that person will take over. Normally the SATCO will just stand at the back and just keep the overall picture and make sure that everybody knows what is going on. He will only intervene when he sees that you are either not seeing something or anything like that (M.2.4). *The team uses it, but sometimes it feels like someone is watching over your shoulder, checking up what you are doing, but sometimes when it becomes hectic you have someone to lean on; you ask – "what do I do now; is it a good decision I made?" (X.1.8).*				
C.1.8	Reflective discussions are influenced by the quality of interpersonal relationships	Personal reflection	Performance reflection (TMD)	Team performance (TP)
D.2.2	After a shift one can reflect on what happened			
G.3.10	Observing others allows you to agree or disagree with actions you observe			
H.2.5	I file information somewhere in my head; others may write it down			
J.3.2	You can see at the different bases what works and what does not			
J.3.7	Teams critically review and react to actions from their members			
K.1.8	After work I review the day's experiences			
K.2.3	Past experience allows for comparisons and decisions			
L.2.2	People making decisions in their own minds			
M.3.4	Controllers ask themselves – how would I have handled …			
N.3.3	We all reflect on occurrences			
N.3.4	Thinking about how to do things better			
O.1.9	Where can we do better			
O.1.10	Through discussions individuals are left with things to think about			

O.2.7	Asking in your mind questions and answering or have answers provided			
P.1.12	I practice things through my mind on a daily basis			
R.2.3	The team forms a perception of its members			
R.2.4	Team members may try to find out for themselves why a certain client perception is being held			
R.2.6	I reflect on the day's occurrences			
T.2.3	I think things over			
U.2.2	After a good period an individual and the team feels good			
U.3.1	Occurrences and associated reflection allows one to evaluate your own performance and ensures that remedial measures are put in place			
W.1.3	Evaluate this team in terms of other team experiences			
W.2.8	I do make use of an internal debriefing session			
W.3.15	Feedback in terms of own performance is important to counter fear and a sense of incompetence			
X.2.9	After a shift I think about what happened			
Y.1.13	After a shift I think about what has happened			
Y.2.1	I had an experience …			
Y.2.2	I was behind the other guys and needed to catch up/meet the standard required			
Y.2.3	You must have a broader mind and understanding of what you are thinking about			
Y.3.5	I think about particular subjects			
Supportive transcript extracts				
I am a kind of a person that everyday after I have worked, whichever position … giving instruction, worked approach, worked FIS … I will think about what I did				

and what I could better … and here I tend to do it even more, I tend to do it a lot more, because we discuss emergencies sometimes in the morning and what somebody did, and then you think, … (R.2.6).

When the shift is over I just relax after that … when something went wrong, or when I am not sure about something then I start going over and over it in my mind (X.2.9).

At times it gets busy … when they are talking … I am thinking about this particular subject and everybody is quiet …. (Y.3.5).

E.3.5	There is always someone looking over your shoulder	Support needs	Performance reflection (TMD)	Team performance (TP)
I.2.7	Approaching others for assistance depends on the quality of the relationship			
J.2.1	Team members need to click			
J.2.5	You cannot work outside a team			
K.2.9	Working in a team has improved my performance			
L.3.7	Social togetherness allows for synergy			
S.2.4	Unhappiness at work can influence relations outside the workplace			
S.2.7	Personal relations are important to counter a non-ideal work environment			

Supportive transcript extracts

I have found that you get a certain synergy in certain groups of people that just click. They work very, very well. Things that happens … you know what the other person is going to do before they do it. Where with other groups you can still work, it is not the system itself failing … (J.2.1).

Teamwork has improved my performance; it has given me alternative ideas to use; it has given me information that I have never known before, sometimes it has given me bad habits as well. … ATC is dynamic, you don't want to stereotype ATC and sometimes teamwork can make you stereotype … you have to think of each situation, no matter how similar, it is differently; I think ATC cannot be stereotyped, it will never repeat itself; no two plans are the same (K.2.9).

A.3.15	Due to perceived differences in status (as a result of team role differences) people doubt their own capabilities and express concern about their individual performances	Influencing performance	Performance reflection (TMD)	Team performance (TP)
A.3.21	Controllers need to understand fellow-team members			
A.3.26	Limited interaction leads to group forming and is not supportive of teamwork			
A.3.27	A strict militarised atmosphere favours groups not teams			
C.3.6	Knowing others' moods and preferences positively influences teamwork			
E.3.9	You learn to adapt to different people's different needs			
Supportive transcript extracts				
If you have a very strict militarised atmosphere that is so ... it is not conducive to people actually picking up. You have to be able to be careful about some things (A.3.27). *It is great working here for one and the people – I think we are a very good team we get along well with each other; it is a fairly new team, so to say also, but we are getting along, getting to know each other – even when someone is not in the best mood and not to do this to that one or this to that one; talk this to that one and this to that one (C.3.6).*				
B.2.5	Observing others handling abnormal situations	Performance occurrences	Performance reflection (TMD)	Team performance (TP)
B.2.6	Being aware of loss of information resulting from others' actions			
B.2.7	Predicting problems in operations			
B.3.9	Observing minority not doing their part			
C.1.5	Inputs from other team members are used or not used. However, the individual ultimately makes the final call			
C.3.9	Informal non-work related discussions allow one to get to know the other person better			

F.2.1	Team has certain expectations concerning new members			
Y.1.7	Supervisor's input is evaluated before implementation of the input is considered			
Supportive transcript extracts				
That is how I learned, I always listen what is going on and what other people are doing. That is why I don't talk about it (B.2.6) *So that he can instruct the guy to go-around. And there was an other member in the tower as well standing and they also elected to push on other than what was taking place - do this, do that. It is information but it is like - use it don't use it! Because at the end of the day it is you are the guy working (C.1.5).*				
G.3.16	Personal differences must not impact on performance	Understanding teams	Performance reflection (TMD)	Team performance (TP)
G.3.18	Teams have reputations that are made known – often not favourable			
H.1.1	Teamwork encourages and allows for professionalism			
K.2.7	Observation allows for subconscious changes rather than instructed/demanded changes			
L.1.3	Different personalities play a role. However, you have to focus on the work			
L.1.9	People who do not fit into to the team are personally but not work-wise segregated			
L.3.8	ATC team viewed as a secluded club			
O.1.4	Teamwork contributes towards professionalism			
R.3.6	The team is concerned about its reputation			
S.3.6	Teams are reinventing themselves as members come and go			
S.3.7	Such team changes/reinvention can be traumatic for members staying behind			
S.3.8	Social efforts help in times when teams have changed			
S.3.9	Social events and participation must be balanced			
V.1.7	Strong teams are proud and regret being broken up			
V.2.13	Friendliness in the team is important			

X.3.2	The team has certain expectations from clients which do not always materialise			
Supportive transcript extracts				
I would say teamwork, our teamwork is rather good because you have got, … it makes the service more professional. Everybody is getting to do the work, and everybody wants to work (H.1.1). *… then there will be misunderstandings; there will not be proper communications, which will then lead to an insufficient service provided to the customer, the pilot. That is why teamwork is so important and not teamwork alone; there must be focused, …it must be professional…(O.1.4).* *… it was the best crew that I have ever worked with; we were all friends. We always used to after hours go to someone's house, even the bosses place or whoever's place and … but in the last (period) that strong link has been broken up. You must build new bonds between people … (V.1.7).*				
H.1.5	You feel wanted	Personal value	Performance reflection (TMD)	Team performance (TP)
H.2.6	You must show interest in the service			
H.3.11	Teamwork in this tower makes me feel proud			
K.1.7	Work satisfaction is important			
L.3.10	I am proud to be part of this team			
S.2.1	A good day at work makes you feel good			
U.2.1	Working in a team can enrich you personally			
V.2.4	I want to be the best and clients must be reassured when they hear that I am controlling			
W.1.10	I like to be happy when I work, because I really like my work			
W.2.3	When working with people of lesser competence my own situational awareness must increase			
X.2.6	Prior to a shift you start to mentally prepare to work with those rostered with you			
X.2.8	Prior to a shift you start to mentally prepare for the work ahead			

Y.1.10	I learned to adapt to other people			
Supportive transcript extracts				
It has the opposite effect, normally it will make you feel dispensable, but in this case it rather makes you feel wanted because the people is willing to help you in a time, …a crisis, instead of just making the job well done (H.1.5). *What is interesting also is that when there is an emergency or when there is something big going on everybody always phones the tower to get the information – its like the people in the tower always knows or is suppose to know. I think our image towards the base and towards the rest of the people is that we are people with knowledge that knows what is going on, people that can make things happen.* *I am proud to be part of such a team. (L.3.10).* *I learned to adapt to other people to provided a safe service … because when I was under training … (Y.1.10).*				
A.1.4	Acknowledgement of specific experience and skills levels/abilities of team members	Performance assistance	Teamwork performance measures (TME)	Team performance (TP)
B.1.3	Each controller checks to make the work easier for the next controller			
C.1.9	As far as possible team members' requests are accommodated			
C.1.4	Post-occurrence discussions with team members involved			
D.1.2	The better the teamwork the better the job outcome			
D.2.1	Work effectiveness brings team members closer together			
E.3.6	Assistance may sometimes be viewed as criticism and not favourably received			
J.2.7	People assist each other during the execution of their tasks			
Supportive transcript extracts				
This also depends on the kind of service you get; as far as possible you do as much as possible to accommodate everyone's requests (C.1.9). *The person looking over your shoulder is the bystander, the supervisor, the person working at the next control position. You have got individuals that stick their noses in where it doesn't belong. But that is more individually, most people will help. We've got a few individuals that may be naaah, …, some people may*				

approach it in a too direct manner and it will be taken up as criticism, but it depends again on the individual and how the criticism is taken (E.3.6).				
A.3.11	Breakdowns in team plans lead to team failures	Performance problems	Teamwork performance measures (TME)	Team performance (TP)
A.3.12	Breakdowns in team plans can most often be linked to teamwork failure rather than individual failure			
J.1.1	Incidents point to a breakdown in teamwork			
N.2.6	You need to be very disciplined			
O.1.13	Willingness to improve and even to rate the team's performance			
S.2.3	Lack of traffic/low business influences personal relations negatively			
Y.2.5	Accepting that mistakes may occur due to a lack of experience			
Supportive transcript extracts				
I think it is easier for examples that shows when teamwork breaks down. Every single day when everything is working perfectly the teamwork is for example … nothing happened, there was no incident there was no accident, however, every incident related to an ATC environment would be an example of where the teamwork breaks down. When the teamwork breaks down there is effects on the outcome (J.1.1). *… I mean you are so depressed, you don't want to come to work, you don't want to go upstairs … Then we organise a pub-lunch, but you don't want to go on a pub-lunch because you sit with these people in the crew-room talking absolute nonsense, playing cards and immediately it affects your personal life and your personal feelings because now you are depressed, because you don't feel valuable (S.2.3).*				
F.1.1	More "eyes" as a result of teamwork impacts upon ATC outcomes	Team performance	Teamwork performance measures (TME)	Team performance (TP)
F.1.3	Teamwork enhances coordination			
J.1.3	When we work together teamwork is great			
L.1.7	Teamwork is better when under pressure			

L.1.11	The good service is definitely linked to teamwork			
L.3.9	Client surveys used to determine team effectiveness			
M.1.9	Traffic is well coordinated between controllers			
O.1.6	Teamwork enhances customer service			
O.1.12	Quality of control work has improved			
Supportive transcript extracts				
Teamwork in the ATC environment is very important. A simple thing like animals which is especially a problem at our ATC centre on and around the runway poses a great threat. With more eyes looking around for and seeing animals crossing or near the runway while you are busy you may have missed as well as vultures and other birds that is already great proof of how teamwork can change the outcome of things (F.1.1). *We deliver quite a good service …in my short experience … and it is linked to teamwork … yes definitely I would say so (L.1.11).*				
J.1.12	Status difference is viewed as a negative influence on teamwork	Status impact	Teamwork performance measures (TME)	Team performance (TP)
J.3.4	Lower status positions have less influence			
N.3.17	Status differences are managed through respect			
P.3.3	Status is not an inhibiting factor when it comes to voicing shortcomings in controlling			
P.3.11	Status and ability do play a role but are not restrictive			
Supportive transcript extracts				
I would actually prefer to have no rank system at all, or alternatively do something that (another nation) do – you are screened at an early age and you go onto approach or tower – you would have for example a (high rank) on tower and a (junior rank) on approach – it has nothing to do with … it is a position and I advocate – don't call me (rank), call me approach, I am working … I am approach right now. Unfortunately it does … because of the way of doing things it gets to your senior people, again personalities … you do get dominant personalities where you find that both experienced people end up ultimately telling, in a military perspective, telling the person what to do in an ATC environment, based on his rank (J.1.12).				

With combining that with the military part of a rank structure where you have got seniority and rank … so its done formally but at the same time informally, to say it like that. The tower controller, the approach controller whoever was controlling at that position irrespective of rank has got the opportunity to address shortcoming which he believes … as experienced as shortcomings during a team's performance. Whether it be against a (senior ranks) it is regardless because at the end of the day it goes about lives (P.3.3).				
A.2.2	Each controller needs to be ahead by an in-time understanding of the other controller's planned and perceived actions	Information sharing	Teamwork dynamics (TMF)	Team performance (TP)
A.1.8	Experiences are shared amongst team members			
B.1.2	During emergencies team members observe each others' actions			
B.1.4	Flow of all relevant information paramount			
B.2.3	Coordination between controllers			
C.1.2	Realise that the entire spectrum of work must be shared			
E.3.3	Collective knowledge and experience is favoured			
F.2.6	Openness for others to provide input and willingness to accept such input			
F.3.5	Mistakes are not easily shared when fear of prosecution is present			
I.1.4	Communication problems may exist due to coordination problems			
I.1.6	Teamwork allows for an understanding of what is happening at other positions			
I.1.7	Teamwork assists in safe planning			
J.2.6	You listen to other people to keep the picture			
K.1.3	You have to rely on information from others			
K.1.9	Teams require rules that all agree to			
L.1.2	Communication lines are opened			

L.1.6	Mutual expectations must be carefully coordinated and monitored			
L.2.3	Assistance and input from others are welcome			
L.2.6	Status and respect are considered important to certain members			
M.1.4	Sharing of information is a critical success factor			
M.1.5	You listen to others and plan accordingly			
M.1.6	Communication is enhanced by people listening to one another in a proactive manner			
P.1.4	Prior knowledge of what is going to happen is evident in good teamwork			
P.1.5	Everybody must know what is going on			
Q.2.6	Effective communication within a team is important			
T.2.4	When necessary I will discuss own experiences with team members			
T.1.5	Team communication is important			
W.2.10	Clear messages need to be sent and received amongst team members			
W.3.11	Delegation of tasks need to be done fairly			
X.1.2	Information flows between control positions			
X.1.3	Mutual understanding is important between control positions			

Supportive transcript extracts

Let also me explain it the other way around - if she only tells approach control only that aircraft is airborne he does not know when it started and where it is going he doesn't also not know what is going on and he will also sound unprofessional over the radio (B.1.4).

Teamwork is definitely important, specially I saw that with the (aircraft type) now; we were not that busy before that, especially with the (aircraft type), especially when they are doing (types of flights) as well as (types of flight). They come in with a (type of approach) you have to have teamwork between your tower controller and approach controller and that they don't send and aircraft and drop it onto you while you have got a busy circuit. You have to have teamwork in the sense that the approach controller understands at least or has knowledge of what is going on in the circuit as well as your tower controller has to have some

knowledge what is going on in the approach area (I.1.6). *They don't delegate the work evenly amongst the juniors. Because some people are smarter than other people, … they just do it half the first time or they don't do it at all and it comes down to one person (W.3.11).*				
A.1.5	Team members have the freedom to assist each other and make suggestions, irrespective of work status	Helpfulness	Teamwork dynamics	Team performance
A.2.1	Team members need to work closely together			
A.3.9	Teamwork relies upon team plans and less on individual plans		(TMF)	(TP)
D.1.3	Working relationships carry more weight than personal relationships			
D.2.5	Allows for critical debate with colleagues			
E.1.3	Relying on others to identify your mistakes			
E.1.8	Freedom to ask for and receive assistance/information			
G.1.5	You are never really alone; you know help is available			
G.2.2	Know that you can rely on others			
G.2.5	During emergencies the team automatically supports each other more intensely			
G.3.8	Freedom to provide input and/or assistance to others			
G.3.14	Personal relationships are important			
H.1.2	Everyone is willing to help one another			
N.1.2	People are willing to assist			
P.3.8	Everybody participates in the creation of solutions			
Q.1.2	Team members need to work together and understand each other			
U.1.6	Mutual understanding is essential for effective ATC and teamwork			

V.1.5	Team members are attuned to one another during a shift			
X.1.6	Students can rely on assistance from other team members			
X.1.7	A system of supervisors is used to assist ATCs			
X.2.5	Knowing another controller in terms of performance and expectations makes controlling easier			
Y.1.5	Team players must support each other			
Supportive transcript extracts				
Everyone that is here, is part of the team – you never know when you are sitting upstairs you might not feel right, you might be upset – you must always know that there is someone that can help. You are never really alone. Or when you are busy controlling and you have to do some admin work and you cannot get time for it, then those people can help – to help you with your daily tasks as well, or just to listen out (G.1.5). *The best aid will be able to work together and to understand … I don't want to use the word "respect" each other for doing something but then if there is any, how can I put it, … shortfalls you can work according to the shortfalls and correct it at the time. Then you will be able to rectify it and you can work as a team and it will work (Q.1.2).* *But with certain people you don't even have to bother about that, you just know it is going to flow. Especially here at (ATSU) with so many aircraft flying … having to cope with someone who doesn't coordinate with you; you just hear someone calling you and then you have to work out – what am I going to do now (X.2.5).*				
A.3.10	Younger/new team members do not realise the importance of team plans	Fellowship	Teamwork dynamics (TMF)	Team performance (TP)
B.3.1	Use and invite others' strengths as a resource			
E.3.7	Communication is important			
F.3.7	Certain situations dictate improved teamwork			
G.1.2	Working together is essential			
J.1.9	Pre-empting and thinking ahead of time is part of the team's activities			

J.1.10	The entire team works towards a common situational awareness			
O.1.5	Teamwork allows for proactive approaches to problems			
Q.3.3	The right attitude is important			
R.2.5	In the workplace you have the freedom to ask for assistance from team members			
W.2.4	Working with people that display competence makes the work effort less			
X.2.3	You try to adapt to newcomers in terms of controlling by picturing their traffic situation			
X.2.4	You play the scenario of other controllers in your head while working			
Supportive transcript extracts				
All I can think of now is with the (aircraft type) that are here – most of the controllers here have never worked with the (aircraft type) before and we have three ex -… (ATSU) controllers and they have given their inputs on emergencies and how their (approaches) look (B.3.1). *You need the picture - you are situationally aware but you cannot be situationally aware if you are not being included in the team … if somebody is excluding you and withholding information it is going to be difficult for you to build your situational awareness and at the end the whole thing is about teamwork (J.1.10).* *So, you try to adapt to them, you try to put the scenario into your head (ATC example stated) … and then figure it out yourself – what am I going to do know? (X.2.3).*				
E.3.2	Trust is critical	Trust & respect	Teamwork dynamics (TMF)	Team performance (TP)
G.3.7	Respect at all levels is important to the team			
G.3.17	Mutual trust is critical			
H.1.3	Cooperation allows for the development of a better trust relationship			
H.3.7	Trust links to willingness to share experiences			
I.2.8	There are some people whom I will not approach			
I.3.7	Own mistakes are resolved through humane conversation with seniors			

K.1.2	Trust is important			
L.2.11	Trust is very important			
L.3.3	Trust and respect are the highest priority			
M.3.10	Team members trust each other's competence			
N.3.15	Trust is important			
N.3.16	Respect is important			
P.2.7	I must be able to trust a person's ability			
P.2.8	I must be able to trust the person as a person			
P.2.9	You must respect the other member's responsibilities			
P.3.10	Freedom needs to be exercised with respect			
Q.1.4	Lack of respect in a team is a major shortcoming			
Q.2.7	Trust in people is important			
Q.3.11	Trust amongst and across status levels is necessary			
S.1.6	Respect is important			
W.2.2	Controllers respect each other in terms of capability primarily and status secondarily			
W.3.12	Trust in working relations is important			
Supportive transcript extracts				
If you sit in the tower where there is issues and people don't trust each other – I see that as an accident waiting to happen. Everyone is different, you get people if they don't trust you then you know, if you did something now then in 10 years time they will still blame you for that and they will still not trust you; and they won't fix It (G.3.17). *Respect, … OK we have got the (organisation) hierarchy and in that case you have to have respect for your superiors, but I must say my personal view is that rank cannot work in a tower – especially when you are working (N.3.16).*				

Teamwork shortcomings … I would say OK, in a personal way … it will be more respect for each other … I would say it is not in place, … Teamwork shortcomings … I would say OK, in a personal way … it will be more respect for each other … I would say it is not in place, … (Q.1.4).				
J.1.7	Overt indicators indicate breakdowns in teamwork	Performance breakdowns	Teamwork dynamics (TMF)	Team performance (TP)
J.2.2	Within a team split-teams have been noticed that work very well together			
J.2.3	Similar types (cautious and cautious) work better than others (cautious and risk-taker)			
M.2.6	An unwritten rule exists in the team – perform!			
U.1.4	Individuals that experience conflict do not communicate well			
Supportive transcript extracts				
… as soon as you see tension developing inside – questions being asked, questions being shouted, strips being thrown, headsets being thrown … these are indications that something is wrong, something has slipped (J.1.7). *People try to work around the situation. At times, from what I have seen, there are people who would just go on and do their job the way it should be done and then there is people who cannot deal with it (reference to the conflict situation) or who can't just go on and do their job, they still feel that this person … I am still not happy with or I don't get along with this person – there is communications that shouldn't be there – so there is always something … the whole information gets lost. That I think is only because, … its an individual thing (U.1.4).*				

Compiled by the researcher

Table 5.11 Results: Impact of self-directed team learning in the air traffic control workplace continuation training scenario

Alpha-numerical codes	Summary of narrative codes derived from actual statements	Descriptive key terms	Subcategories	Categories
F.3.3	Formalised continuation training is also used to aid learning	Characteristics	Continued learning strategies (CLA)	Continued learning (CL)
Q.3.6	Continuation training should be linked to local experiences			
R.3.7	A formal form of continuation training without fun is poorly supported			
T.3.6	A formal continuation training process is utilised			
T.3.7	Quizzes, presentations and exams are utilised in terms of continuation training			
U.3.8	Continuation training takes place in a formal manner			
U.3.10	Continuation training methods are exams, case studies, discussions and lectures			
V.2.11	Continuation training consists of tests, which are supported			
W.3.8	Workplace occurrences are worked into continuation training briefing sessions			
W.3.9	Briefings and exams are used during continuation training			
W.3.10	People experiencing difficulties and voicing them, need to prepare a continuation training briefing to address them – this does not motivate voicing of concerns			
X.3.8	Continuation training takes place twice a month			
X.3.11	Informal discussions may take place after continuation training exams			
Supportive transcript extracts				
How we deal with that at this unit is we have got a training officer in our section and the person will identify needs coming from juniors or seniors in our work environment … if there is a lack of knowledge, and then she will appoint someone, a junior or a senior person and that person will have ample time … a week or				

two … to do research and prepare himself … (T.3.6). *… but then the training officer will come to you and say that this and this happened and the CATCO wants you to prepare a briefing; and then (the person) will put that briefing into continuation training or in our files. We have got like school books with home work … and then the training officer will put up ten questions and you have got to look all over the show for the answers. If something like that happens yes, … like I said if you had a bad experience and the training officer feels that you have to learn from it, … the training officer gets the overall freedom … if 60% of the people of the tower don't know something then the training officer makes something big of it to give continuation training on a thing like that (W.3.9).* *No formal discussions take place after these exams, discussions, … maybe with your colleague or you discuss "what did you think?" (X.3.11).*				
A.3.19	Further formal training (approach training) helps to create ATM mental models. However, it is no guarantee	Formal climate	Continued learning environment (CLB)	Continued learning (CL)
A.3.20	Professional training and experience leads to better teamwork			
Supportive transcript extracts				
When you see the bigger picture or are suppose to see the bigger picture. Then you have to; then you really start to realise what we have to do together. But even then there is some of them that probably doesn't see it and that is where the weakness is also sometimes in approach controllers. They might get individual situations right but they don't have a whole traffic plan. *The more professional training and experience one undergoes leads to better teamwork at the end (A.3.19 & 20).*				
H.3.10	Teamwork should be included in training courses	Conditions	Continued learning expectations (CLC)	Continued learning (CL)
R.3.5	Continuation training cannot be viewed by the team as punishment because then it won't be accepted			

Supportive transcript extracts				
Because training is very individualised at the moment. It is more about you than the rest of the team and then more stress the fact that experience needs to be shared between people instead of just been kept to yourself (H.3.10). *The team is very negative about continuation training … in this team I think they see it as punishment which is not the case; that's the first thing … and I got the idea, and this is absolutely a perception, because this is my perception coming from the outside … (R.3.5).*				
R.3.8	Continuation training allows for the identification of team members' lack of knowledge areas	Significance	Continued learning value (CLD)	Continued learning (CL)
U.3.9	Formal continuation training helps the people			
V.3.1	Continuation training tests situational awareness			
X.3.9	Continuation training forces us to learn			
X.3.10	Continuation training is good			
Supportive transcript extracts				
And that, I think, has definitely helped the people around here, especially the people who has just come from tower course or whatever course you did and you just come to validate and you don't open the book again. So, you get rusty and continuation training definitely keeps you on your toes and keeps the mind going (U.3.9). *One of the others also said that he finally understands something he has been writing exams about for two, three years, and he finally understands things now (X.3.10).*				

Compiled by the researcher

Table 5.12 Results: Impact of self-directed team learning dynamics within self-managed air traffic control work teams

Alpha-numerical codes	Summary of narrative codes derived from actual statements	Descriptive key terms	Subcategories	Categories
ZA.2.12	Close-mindedness of especially young members does not encourage observing others at work	Diagnosis	Individual learning preferences (TLA)	Team learning (TL)
ZA.3.2	Time for learning needs to be set aside, albeit a little at a time			
ZB.3.2	Client needs influence learning opportunities			
ZB.3.11	New members have a need to consolidate alone once qualified			
Supportive transcript extracts				
We've got no formal time for learning. Say you have got time, even if it is 20 minutes in the morning when everyone is having their coffee … but also that can't … really work … you've got 20 minutes and say … OK, this sounds silly, but say aircraft types … my aircraft type recognition is bad, very bad. If you just say … I think the (rank) made a point about it this morning. Say you have a picture of a (aircraft type) and you show it in the morning and everyone gets one and you go this is this, this is what it is used for … Or you take an aircraft emergency; like here we've got … it's a small thing – and someone gets to present it or just read it; everyone listens – something will go in (ZA.3.2). *Then you don't really consolidate and what makes this place different, danger … is sit here for two or three weeks doing the normal, then all hell breaks lose and suddenly you have to be at the top of the game … (ZB.3.11).*				

ZB.2.5	Members want to learn by seeing what is taking place	Skills development	Individual learning preferences (TLA)	Team learning (TL)
ZB.3.5	Practical hands-on controlling provides the input for informal learning			
ZB.3.6	Simulation capability in the workplace will assist with continued learning			
Supportive transcript extracts				
ATC is practical, if you don't do any practical work then you will not be sharp enough. Because then all the theory means nothing, you have to experience it on the job, there … practically (ZB.3.5). *And things like this; just because you are here now, you are focusing a lot of our attention on training and learning skills. So, the more you are involved with things like this … if I perceive a sudden opening up and thinking again of our training environment, I am sure everybody else also to a certain extent think about it again. You are so busy doing your day-to-day task that you actually forget about … you know what at the school we did this and we did that and this is how … the planned learning environment. We have spoken about it; … if each tower had a simulator … with different scenarios … it would assist greatly (ZB.3.6).*				
ZA.1.12	A great deal of learning will be of an informal nature	Informal discussions	Participative learning (TLB)	Team learning (TL)
ZA.2.5	Less formal learning is facilitated by open-book tests, quizzes and lectures			
ZA.2.8	Informal discussions at all levels are encouraged and do take place			
ZA.2.9	New workplace demands encourage informal learning			
ZA.2.16	Storytelling is used when people show an interest			
ZA.3.3	Learning may be experienced-based, problem-based and descriptive-based			
ZB.2.4	Work-related conversations lead to team discussions			
ZB.3.7	More practical experience/exposure unlocks more discussion			

Supportive transcript extracts				
Everybody is more than welcome to say (implying junior members) … we had it fairly recently when people say "I really don't understand it" maybe we should look at this or where junior people has expressed concern over up-coming events that they have never dealt with. Then they say - listen we need to have to have a talk around a table as a group around this subject (ZA.2.8). *Everybody knows about it and everybody is talking about it, especially (person); he likes talking so everyone is drawn into the conversation as I said – people aren't scattered, it is a strange magnet, they are drawn upstairs (ZB.2.4).*				
ZA.1.13	A formal induction and training phase does exist for newcomers and will be conducted by the training officer	Formal learning	Participative learning (TLB)	Team learning (TL)
ZA.2.6	Formal learning consists of exams and validation periods and further development courses			
Supportive transcript extracts				
When somebody arrives here the training officer will take him and obviously you have your standard training profile that you will go through with the person; you will see very regularly the person taking that person off to the side and showing them … (ZA.1.13). *There will be a curriculum and set exams that he has to go through … he will obviously get the necessary lectures on each subject, specifically things like the area and that which is unique which is not generic like let-downs. And then he will go through the exams and then do the prescribed validation periods … (ZA.2.6).*				
ZC.1.8	Newcomers to the team need to take responsibility for their own induction to a large extent	Internal directed	Learning individual orientation (TLC)	Team learning (TL)

<table>
<tr><th colspan="5">Supportive transcript extracts</th></tr>
<tr><td colspan="5">A person joining this team can expect … I don't think non at all for the first 3 or 4 months until the people get to know you. I think it is you for yourself and you might as well "skrop your paadjie" (ZC.1.8).</td></tr>
<tr><td colspan="5"></td></tr>
<tr><td>ZA.3.5</td><td>Information needs to be processed and made available for learning purposes</td><td rowspan="4">Design considerations</td><td rowspan="4">Training design

(TLD)</td><td rowspan="4">Team learning

(TL)</td></tr>
<tr><td>ZB.2.9</td><td>Other planned learning is driven by the leader and training officer</td></tr>
<tr><td>ZB.2.10</td><td>Shortcomings/training needs identified are communicated to the training officer by any member</td></tr>
<tr><td>ZC.3.4</td><td>Use of questions (experience based) is suggested to enhance learning</td></tr>
<tr><th colspan="5">Supportive transcript extracts</th></tr>
<tr><td colspan="5">We have a book up here, that's been lying here for a while on case studies of all the near miss events in England for a year – what did the controller do wrong? what did the aircraft do wrong? It's been lying here we could have used it for training, I suppose we should have already. But that kind of information is readily available … (ZA.3.5).
… you think that more than one person in the tower doesn't know it … then she will make it part of the continuation training for instance, by asking questions related to that situation or scenario (ZC.3.4).</td></tr>
<tr><td colspan="5"></td></tr>
<tr><td>ZB.2.11</td><td>Learning is streamlined into being purposeful</td><td>Implementation goal</td><td>Training implementa-tion (TLE)</td><td>Team learning

(TL)</td></tr>
<tr><th colspan="5">Supportive transcript extracts</th></tr>
<tr><td colspan="5">The learning experience is streamlined by purposeful learning – "why do you do something, does it have purpose, what is the reason for doing it this way?" – that question is asked a lot. If it doesn't get answered then it gets changed (ZB.2.11).</td></tr>
</table>

ZA.2.29	The need for team building initiatives is not supported, however, social building is supported	Team building	Operational training characteristics (TLG)	Team learning (TL)
ZC.3.1	More should be done in terms of team learning, away from work, involving everyone			
Supportive transcript extracts				
… socials is the closest that we get to it. We are not formalised on one of those … type of things – no not formalised but a lot of socials and interactions – which is easier here because we live together. We have just had a big team building session with the (country) here, with the (aircraft squadrons). We don't need to go out and know someone better; how well can you know by knowing what this person is able to do?, and what he does every day. In that comes respect … now you've got this team and we are constantly working as a team – there is no need for team building – there is actually a need for lets not be a team any more! Let's be friends, … Because we are constantly team building – working together. In the last two months we've been working our asses of. People have been under enormous pressure in doing their jobs and that is how you identify, or get to know the real person. Put him under pressure and see what he does. We have seen it, we have seen it from everybody (ZA.2.29).				
ZA.1.9	The team will identify learning opportunities – what can be learned from newcomers	Learning transmission	Operational training characteristics (TLG)	Team learning (TL)
ZA.1.17	Once newcomers finish their training they will still be watched			
ZA.1.18	Newcomers and people experiencing work difficulties will receive more attention			
ZA.2.13	Formal training at college level needs to fulfil all work and attitude requirements			
ZA.2.19	The team expects people to display/gain more than the minimum knowledge			
ZB.2.1	Validation training is planned learning			
ZC.2.1	Each ATC must assume responsibility for his/her competence			

Supportive transcript extracts				
Planned learning is the validation, when you get here there is a plan, you will start at zero hours and you will work through. You have to write your exams, you have to pass your exams you are under continued evaluation during validation; that's the plan (ZB.2.1). *I think it is each ATC, looking at individual roles, … its his responsibility to maintain a high level of knowledge in the ATC line … he must make sure he is up to date with changes in the environment … keep yourself on a high standard (ZC.2.1).*				
ZC.3.2	Team learning should be built upon a social foundation	Socialising	Learning environment (TLH)	Team learning (TL)
ZC.3.3	An environment of freedom to ask should be cultivated in order to ensure that learning takes place			
Supportive transcript extracts				
If you make it interesting, … there is such a whole wide world out there with regards to what you can learn and what other people can learn. I think if you start to do it more on a social basis you won't have to feel like you are at school (ZC.3.2).				
ZA.1.8	The team will develop so that you become part of the team	Involvement	Learning environment (TLH)	Team learning (TL)
ZB.2.7	People who are experts/have a lot of knowledge like to share information/experiences			
ZC.3.7	People who have a special interest in aviation should share this during learning events			
ZC.3.15	A willingness to share information and experiences is important			
Supportive transcript extracts				
What I also see is people who have a certain extent of knowledge about the subject … relevant or irrelevant … it is sort of a challenge to note something that somebody else don't know (example provided). And then they share it (ZB.2.7). *If it can work … I mean if I feel that I can talk about this aircraft then I can do it. If I was at an air show this weekend at (venue) and this is what I saw and, and, and ... You can get a broader picture not just (industry/organisation specific) (ZC.3.7).*				

ZA.3.4	Access to information is an important team learning resource	Dynamics	Learning environment (TLH)	Team learning (TL)
ZB.2.3	Certain occurrences are also documented for future reference			
ZB.3.10	Experienced controllers should not be neglected in terms of work allocation due to student training priorities			
Supportive transcript extracts				
People should think "what is that?" Having it more visual, having more aids! And access to information … currently we don't get … you remember now in the olden days we got, yearly all the newest ICAO docs …nowadays you don't; there is some of it on the internet but you have to actually subscribe to get some of the documents – that is not done anymore (ZA.3.4). *… it gets put into the occurrence log and that is briefed very comprehensively in as far as possible whoever were involved and not involved … what did we learn out of that? … especially positive (ZB.2.3).*				
ZA.1.10	Newcomers must show eagerness/readiness to learn	Facilitation considerations	Team learning facilitation (TLI)	Team learning (TL)
ZA.1.14	There is a subtle move from coaching towards mentoring			
ZB.2.6	Use of formal training days is made			
ZB.3.9	Teams like new challenges to learn from			
ZC.3.5	A culture should exist whereby every person can suggest/identify learning opportunities on behalf of the team			
ZC.3.10	Members are not willing to sacrifice their own time for formal learning			
ZC.3.11	A trigger of interest is required for a team to learn			
Supportive transcript extracts				
… and you get set in those ways, you don't do things differently and you get used to it and don't think of other ways of doing it (ZB.3.9).				

So, first of all you have to trigger the interest; you have to trigger the passion again … OK it is no one's job, no one has to do that, but if you want the team to work together you have got to trigger their interest once again. Otherwise you are going to get this response over and over again (ZC.3.11).				
ZA.1.11	A mutual sharing of information, experience, knowledge expectation is held	Value	Team learning facilitation (TLI)	Team learning (TL)
ZA.1.15	Leadership monitors not only work performance but also assists with mentoring			
ZA.1.16	Senior controllers will too a large extent take care of weak performers (work)			
ZA.3.9	Individual learning queries are often best solved by the individual concerned or another individual, not necessarily the team			
ZB.3.8	Information sharing is possible if more practical experience is gained			
ZC.1.5	Learning about diversity is taking place			
ZC.2.2	Formal training needs expressed by members are not always satisfied			
Supportive transcript extracts				
But a lot of it will happen quickly and then they will realise that this guy has serious issues getting to work or getting to his people or whatever – and then there is assistance there sometimes. We find that we need as a group nowadays … as a CATCO you look at more than just the ATC side, there is a lot of the personal issues that the younger people come with that is not resolved. They don't have the tools to resolve – and that the group also looks after. I've had a few of those where I had to worry about more than ATC, … I had to teach them … (ZA.1.15.). *When I look in your face you see it as good manners. I think that we are all learning, I think we are all learning and trying to adapt, … off the culture … (ZC.1.5).*				

Compiled by the researcher

Table 5.13 Results: Impact of teamwork on air traffic control workplace performance outcomes

Alpha-numerical codes	Summary of narrative codes derived from actual statements	Descriptive key terms	Subcategories	Categories
ZA.1.2	Focus of newcomers will be on task	Team relationships	Team work characteristics (TMA)	Team performance (TP)
ZA.1.3	When a newcomer arrives he/she is considered part of the group socially			
ZA.1.6	The team assesses newcomers to determine the type of person			
ZB.1.1	Newcomers can expect support from the team that will make adjustment easier			
ZB.1.2	Support to newcomers is provided in terms of work support			
ZB.1.3	Support to newcomers is provided in terms of social support			
ZB.1.6	The team will defend its unity			
ZB.1.10	Members will test individuals to see what individuals can give/provide to the team			
ZB.1.19	Strong unity is important			
ZC.1.9	Newcomers need to prove themselves prior to being accepted by the team			
ZC.1.11	Rumours and perceptions often arrive at the team before the individuals arrive			
Supportive transcript extracts				
I would like to maybe add that the team would at assess you at first and see what type of person you are … (ZA.1.6). *Strong unity … especially this team does not like anybody trying to split up the team … any such effect is put down as soon as possible (ZB.1.19).*				
ZA.1.4	The team will not adapt around a newcomer	Conformity pressures	Team work characteristics	Team performance
ZA.1.5	Newcomers must work from their side in order to become part of the team			

ZA.1.21	Non-conformers are monitored closely by the team		(TMA)	(TP)
ZA.2.25	Members will not be allowed to pull down the team			
ZA.2.26	People who do not fit into the team tend to leave the team voluntarily			
ZB.1.5	Newcomers that do not show commitment and effort will find themselves distanced from the team			
ZB.1.13	Members will not cover up mistakes			
ZB.1.15	If you sell the team short or backstab you will be isolated			
ZC.1.1	A "know-it-all" approach by a newcomer is not well received by the team			
ZC.1.2	Newcomers need to first understand the team before becoming part of the team			
ZC.1.3	The team can see who will adapt and who will fit in			
ZC.1.4	Diversity issues impact upon this team's acceptance of newcomers			

Supportive transcript extracts

If you get someone who doesn't want to work with or try to blend in or accept where they work they make the rest of the people negative …you are also going to try and, not push them aside, but you not going to allow, …say you are happy here and you are enjoy your work and you take everything that you get here, but there is someone that just put down their foot and say they will not like it and they will never like it then you will tend just to let that person go. Because if you going to keep on trying to help them they are going to pull you down. Then you are going to be negative and you are not going to enjoy your job and you are not going to like A, B and C and E because they don't like it. So, I think that if it takes … the group … shutting the person out but you must not allow that one or two persons can pull down your whole group (ZA.2.25).

One thing that I can say even if you do want to fit in … I think culture has got a great impact on the team, specifically here … there is definite lines, you can see who will adapt to who and who will fit in where (ZC.1.3).

ZA.2.14	People should have a burning desire to do this type of work	Individual focal point	Team work characteristics (TMA)	Team performance (TP)
ZA.2.17	Members should illustrate an interest that is more than simply meeting work requirements			
ZA.2.18	Uninterested parties are distanced			
ZA.2.20	People who do not display adequate knowledge, will not represent the team			
ZA.2.21	Professionalism remains crucial			
ZA.2.24	Individual mistakes are felt by the team			
ZB.1.9	Newcomers must be able to accept jokes and make jokes			
ZB.1.16	Professionalism is important			
ZB.1.17	Discipline is important within the team			
Supportive transcript extracts				
I think that, that statement of the (rank) links in to what was said previous – what not to expect. If that is the guys attitude you tend to say to yourself why bother telling him which year the (aircraft type) was designed, built and painted and why was it done that way, because he shows no interest. He can do his job, he can tell you "clear to land", " clear to take off", but further than that he does not want to explore. He just wants to do what the piece of paper says he must be able to do, but nothing beyond (ZA.2.17). *… but you will find all of a sudden … everybody is very busy the weekend; they can't take your responsibility, they are not willing to make the sacrifice. I honestly don't feel that the professional capacity will be compromised when it comes to controlling (ZB.1.16).*				
ZB.1.11	There is no unresponsive or silent partner in the team, each member must contribute	Team roles	Team work characteristics (TMA)	Team performance (TP)
ZB.1.12	Assistance is provided by the team to members and by members to the team			
ZC.1.6	Team members consider the impact of newcomers to the team in terms of their own individual positions			

Supportive transcript extracts				
There is no silent partner in the team; there is either an active participant in the team in all aspects … To become a valued member of the team you have to put something into it. This is what it goes all about. The team will not carry dead wood, you have to become an active and useful member of the team; … (ZB.1.11).				
ZA.1.7	The team assesses newcomers to determine the person's work contribution	Collective focus	Self-efficacy (TMB)	Team performance (TP)
ZB.1.18	Everyone must be a team player			
Supportive transcript extracts				
Ultimately because each member of the team is relying on another member, … if you slip up … (example stated) … then it is the whole team who has the problem. I think that is the big thing, each member knows exactly what he is responsible for, and he is not responsible to the CATCO he is not responsible to the (higher rank), he is responsible to the team initially … everyone is a team player (ZB.1.18).				
ZA.1.1	Newcomers can expect assistance, suggestions and help from the team	Duty responsibility	Teamwork activities (TMC)	Team performance (TP)
ZA.2.15	People who ask questions are appreciated			
ZA.2.22	The team will not allow its members to negatively influence service delivery			
ZB.1.4	Newcomers must also invest/make an effort to pull their own weight			
ZB.3.1	The team realises that performance is dependent on the challenges posed by clients			
ZB.3.3	The team environment is dynamic			
ZB.3.4	Members share information			
ZA.1.1	Newcomers can expect assistance, suggestions and help from the team			
Supportive transcript extracts				
As soon as the team starts suffering because the person not willing, or not doing his job correctly, … that will be addressed immediately – the person will not be				

left to just screw up further. But you will find that an ATC team is a very close-knit group and is very easy … (ZA.2.22).

I think there is a great deal of support when that person tries … I can verify it, I was delayed for a month due to my move and I found a lot of understanding, they understood my situation … (ZB.1.4).

ZA.1.20	The team identifies certain aspects/indicators that help them to form a perception of the newcomer's attitude	Reflection	Performance reflection	Team performance
ZA.2.10	People after shift/work think about what happened during the day			
ZA.2.11	Close-mindedness of especially young members does not encourage reflection		(TMD)	(TP)

Supportive transcript extracts

… that you will hear or see something that you haven't seen before; or learn something from them. It is absolutely imperative for a person to be able to stand to the side and learn what is going on there, because no ATC situation is ever the same … out of every two-hour period that you work or somebody else work you will see stuff that is been done differently to the way you should have done and you can actually afterwards say to yourself "that's maybe the better way to do it" or "I wouldn't have done it that way I would have done it this way" (ZA.2.10).

ZA.2.23	ATC team is a tight unit	Support provided	Performance reflection (TMD)	Team performance (TP)
ZB.1.8	Newcomers will get to learn the personalities of others			
ZB.1.14	The team provides a support mechanism and is a close-knit team			
ZC.1.7	Prevailing organisational culture is part of the team and newcomers/juniors need to adapt to it			
ZC.1.10	Assistance from the team by a newcomer is appreciated			

Supportive transcript extracts

But there is confidence in the support; the team becomes a support group; I think we said it right at the beginning as well, we are such a close group of people, we work together, we live together to a large extent, and we act together … ultimately that is your strength … (ZB.1.14).

ZB.2.8	It is satisfying and motivational to assist clients and colleagues	Value	Performance reflection (TMD)	Team performance (TP)
ZB.3.12	It is important for the team to obtain client feedback relating to their quality of service			
Supportive transcript extracts				
… ATCs because of an inherent need to help people, they want to do something. This is a case of you want to get your knowledge to help. You actually feel good, a sense of accomplishment, by knowing something that your colleagues don't know and you can assist them because they want to know that. And you get a positive response out of that (ZB.2.8).				
ZC.1.12	Teams may feel threatened because of newcomers	Threat	Performance reflection (TMD)	Team performance (TP)
Supportive transcript extracts				
… we tend to hear that a person is like "that and that and I promise you when they come to the tower they are going to do this and this" – and automatically the crew is on the defensive before they even get to know the person. I don't know if people are threatened by new incomers but I think they build up a theme before that person comes in so that they can be ready to whatever comes their way to adapt to that or accept the situation (ZC.1.12).				
ZA.1.19	Newcomers must enter the team with the right attitude and interest or else they will not be successful	Attitudes	Teamwork dynamics (TMF)	Team performance (TP)
ZB.1.7	Newcomers can expect respect from the team and will not force compliance			
Supportive transcript extracts				
I think a person coming here must be in the right mindset to give his 110%. If that person is not willing to do what he must … should not expect to be treated as				

good as he would have been treated if he had done his part. If he does his best he would get twice that back from the team supporting him. If a person does not, I don't want to use … conform to the team, it is not the right word, … But if he is not doing what he should, he should not expect what … 110% support from the team (ZA.1.19).

Compiled by the researcher

Table 5.14 Results: Impact of self-directed team learning in the air traffic control workplace continuation training scenario

Alpha-numerical codes	Summary of narrative codes derived from actual statements	Descriptive key terms	Subcategories	Categories
ZA.2.1	Continuation training is programmed for a year and takes place monthly	Characteristics	Continued learning strategies (CLA)	Continued learning (CL)
ZA.2.2	Questionnaires are used and occurrences that were observed/reported are included as continuation training			
ZA.2.3	Day-to-day shortcomings are addressed by presentations and exams			
ZA.2.28	Continuation training comprises of (1) revision and (2) new stuff			
ZA.3.7	Informal continued learning is by means of discussions			
ZB.2.2	Continuation training includes debriefings after occurrences			
ZC.2.4	Continuation training needs may be the result of weaknesses in SOP knowledge			
ZC.3.8	A proper level of foundation knowledge is important in order to make a success of continuation training			
ZC.3.12	Continuation training should be more fun			

ZC.3.17	Continuation training needs to be more visual (notice boards used)			
Supportive transcript extracts				
Collective learning is obviously continuation training. A person is appointed to do that every month; and then he sets up the programme for the year (ZA.2.1). There is two components to continuation training, the way we see it, the one is revision and the other one is new stuff. All the CATCOs and everybody I have ever been to loves the new stuff – learning about a little bit wider, everyone hates the revision. To go through the (document) from page one again and re-read … is not stimulating. But, every stimulating subject is normally received with joy, whatever, the people enjoy it. But, the other component that your (organisation) hammers on is the revision – "when last did you read through …" that is not normally enjoyed. Personally I enjoy it, I like to see what I still remember … it should actually be about what can't I remember and go take the time and read up on it (ZA.2.28).				
ZA.3.1	Time for continuation training is reported as being limited – we have got no time for formal learning	Conditions	Continued learning environment (CLB)	Continued learning (CL)
ZC.2.5	Resource availability hampers continuation training			
ZC.2.6	Resources constitute internet, magazines and documents			
ZC.3.6	Continuation training should not be one person's responsibility			
ZC.3.9	Without passion and interest in the work the continuation training efforts may not be successful			
ZC.3.13	Members must be comfortable with their involvement in continuation training			
ZC.3.14	The team must collectively take responsibility for continuation training			
ZC.3.16	Continuation training should be conducted in a culture of spontaneity			
Supportive transcript extracts				
If something was identified and we need to do continuation training or just revision, or lets learn something new not everybody is ever able to give their undivided attention for an hour to get this done, to make it interesting, get the people to learn – there is just not time for this (ZA.3.1).				

… so it helps a lot, I am very keen on the continuation training … I think it is nice, but I just say … why must everything be initiated by one person in the team? Why must the training officer say everyone can give a briefing? Why can an individual not go to the SATCO, CATCO or any one of the (senior ranks) and say … "I would like to give a briefing to the members about …" (ZC.3.14).				
ZA.2.7	Continued formal learning is not guaranteed	Condition	Continued learning expectations (CLC)	Continued learning (CL)
Supportive transcript extracts				
There is a lot of people that is allowed from the people for courses that they are willing to do or would like to do, however, in practice nowadays the wish list is a lot bigger than what actually happens. There is a definite difference between what we all would like to do and what we all can do. That is unfortunately something that has to be managed (ZA.2.7).				
ZA.2.4	Client surveys are used to identify continuation training needs	Significance	Continued learning value (CLD)	Continued learning (CL)
ZA.2.27	Continuation training is generally supported by all members			
ZC.2.3	Collective learning is found in continuation training			
Supportive transcript extracts				
People do not have an option to not participate in continuation training – … One tries to be nice about it, to sell it as a concept as oppose to dictate it as a concept … I can't make you write the right answer … I can just make you write something. I can't imagine any individual having that attitude, I have never seen that, because it is up to his own benefit and the team's benefit – you can only benefit by this. He cannot be negatively … nothing negative can happen to him while doing continuation training. I have never seen anybody have a problem at that level (ZA.2.27).				

Collective learning … I think collective learning is continuation training and that should be determined by looking at the group … where is the weakness in the link … in terms of knowledge or SOP knowledge or anything like that (ZC.2.3).				
ZA.3.6	Formal continuation training is limited	Limitations	Continued learning value (CLD)	Continued learning (CL)
ZA.3.8	Some team members miss continuation training experiences due to work loads			
Supportive transcript extracts				
We've got everything in place for the training, we just don't have the time. The way we do it currently, the continuation training, the only way that we can get it done is the team member has got a little booklet, exam or the topic for discussion or revision is put on a piece of paper and put into your little booklet and its left there (ZA.3.6). *So, but the unfortunate thing is that only one or two people are part of that, not the whole team. You can't afford …you haven't got time for the whole team to sit around a table and discuss. So, a lot of people lose something … one or two people have now learnt a lot but poor old (name) which was busy (activity) missed it. And what is the chance that he will ever pick up on that again (ZA.3.8).*				

Compiled by the researcher

3 Quantitative results

Quantitative results	Self-directed Team Learning Questionnaire (SDTLQ) results	Self-directed Team Performance results
		Self-directed Team Learning results
		Team performances and self-directed team learning relationship results
		Continuation training results
	Team learning approaches and self-directed team learning relationship results	

3.1 Self-directed Team Learning Questionnaire (SDTLQ) results

SDTLQ data were collected from 25 respondents. The composition of this respondent group is presented in Table 5.15.

Table 5.15 Biographical data (V2 – V11)

Respondent gender						
Male						15
Female						10
Number of respondents per air traffic control centre						
FALW (Langebaanweg)						9
FALT (Makhado)						7
FAHS (Hoedspruit)						9
Military rank held per respondent						
Non-Commissioned Officer	Candidate Officer	Second Lieutenant	Lieutenant	Captain	Major	Lieutenant-Colonel
0	0	5	9	4	5	2
Validations held per respondent						
Flight information service						8
Ground control						20
Aerodrome control						25
Approach control						9
Ground-controlled approach						4
Period of employment at a centre per respondent						
Less than one year						5
More than one year but less than three years						11
More than three years						9
Respondent positions						
Command and Control Assistant	**Air traffic controller**	**Senior air traffic controller**	**Chief air traffic controller**			
0	18	5	2			

Compiled by the researcher

SDTLQ data allowed for the description and comparison of phenomena as well as intra-team and inter-team comparisons. SDTLQ data analysed presented learning and performance characteristics of the three self-directed teams and identified team-based similarities and differences with regard to predetermined characteristics.

Question 23 (V150 – V153) of the SDTLQ encouraged respondents to provide additional information that was considered to be appropriate to this study. Only two respondents made use of this opportunity to provide additional information. From a qualitative perspective this information was reported. However, no trend could be established.

3.1.1 Self-directed Team Performance results

Self-directed team performance data (V12 – V71) were collected from 25 respondents (N=25). Data analysed are presented in 6 cumulative categories as illustrated in Table 5.16.

Table 5.16 Cumulative data categories

SDTLQ question number	V- numbers	Data category
7	V12-V25	Team work characteristics
8	V26	Self-efficacy
9	V27-V40	Team performance activities
10	V41-V47	Individual reflection
11	V48-V63	Teamwork performance measures
12	V64-V71	Team performance dynamics

Compiled by the researcher

To satisfy my need to describe and compare phenomena I needed to determine which viewpoints held by respondents were reported foremost. Creating this awareness aided understanding of self-directed team performance phenomena from a qualitative perspective. Of interest to me was thus to determine each V-number's modus and associated frequency within each data category. These are presented below.

- Team work characteristics (V12-V25) are graphically illustrated with reference to modus and frequency in Figure 5.2.

- With respect to self-efficacy (V26) 17 respondents reported that air traffic control team performance is characterised by setting goals and involvement by all team members during difficult controlling periods/tasks.

- Team performance activities (V27-V40) are graphically illustrated with reference to modus and frequency in Figure 5.3.

- Individual reflection activities (V41-V47) are graphically illustrated with reference to modus and frequency in Figure 5.4.

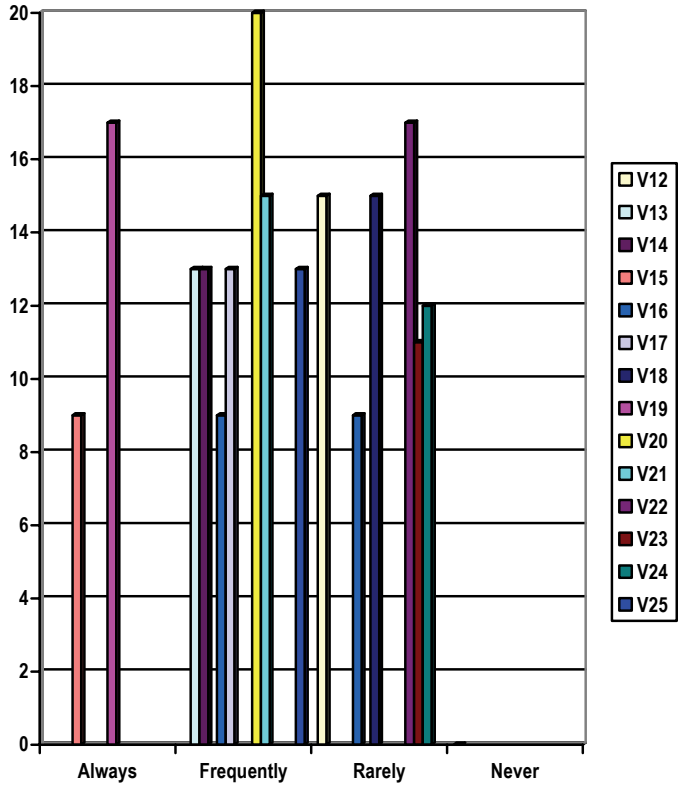
- Teamwork performance measures (V48-V63) are graphically illustrated with reference to modus and frequency in Figure 5.5.

- Team performance dynamics (V64-V71) are graphically illustrated with reference to modus and frequency in Figure 5.6.

- Two respondents provided team performance data in response to question 23 (V152).

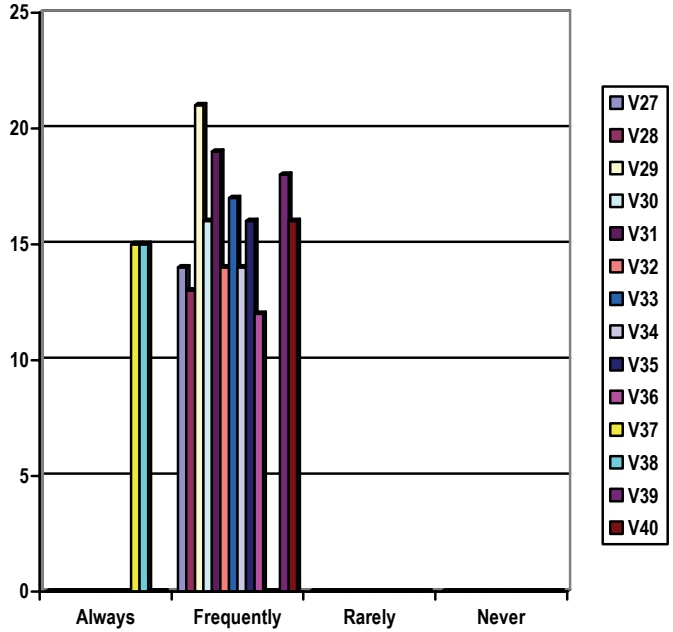
    - One respondent stated that during heavy and difficult traffic density periods the effort relies heavily on the team.
    - One respondent stated that as a newcomer to a team it takes time to work together and to really get to know a team.

Figure 5.2 Teamwork characteristics

Graphic presentation	Explanation
	The following were rated as **always**: • Certain air traffic control roles are considered more important than others (V15). • The air traffic control team is willing to learn as a result of experience (V19). The following were rated as **frequently**: • Pressures to conform (V13). • Power shared amongst team members (V14). • Individual contributions are encouraged (V17). • Internal commitment amongst members is present (V20). • Team members handle criticism well (V21). • The pace set by the team meets the needs of all team members (V25). The following were rated as **rarely**: • The team covers up blunders/mistakes (V18). • Conflict occurs between team members (V12). • Misunderstandings prevail (V22). • Team members act defensively when confronted (V23). • Team members attempt to understand why people behave in certain ways (V24). The following was rated equally as **frequently** and **rarely**: • The team is viewed as being more important than team members (V16).

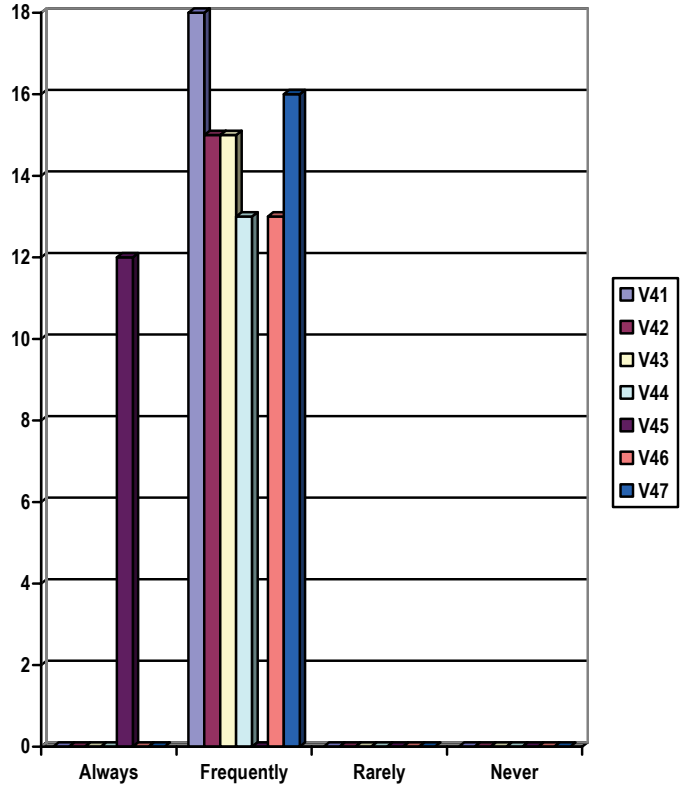
Compiled by the researcher

Figure 5.3 Team performance activities

Graphic presentation	Explanation
	The following were rated as **always**: • Upholding air traffic control standards and processes (V37). • Safeguarding air traffic control standards and processes (V38). The following were rated as **frequently**: • Gathering of information (V27). • Reporting of information (V28). • The creation of new ideas (V29). • Experimenting with new ideas (V30). • Exploring new opportunities (V31). • Assessing the applicability of new work processes (V32). • Establishing new ways of making things work (V33). • Implementing new ways of making things work (V34). • Delivering safety-focused outputs (V35). • Integrating the work of others (V40). • Coordinating the work of others (V39). • Continuously checking the working of the air traffic control system (V36).

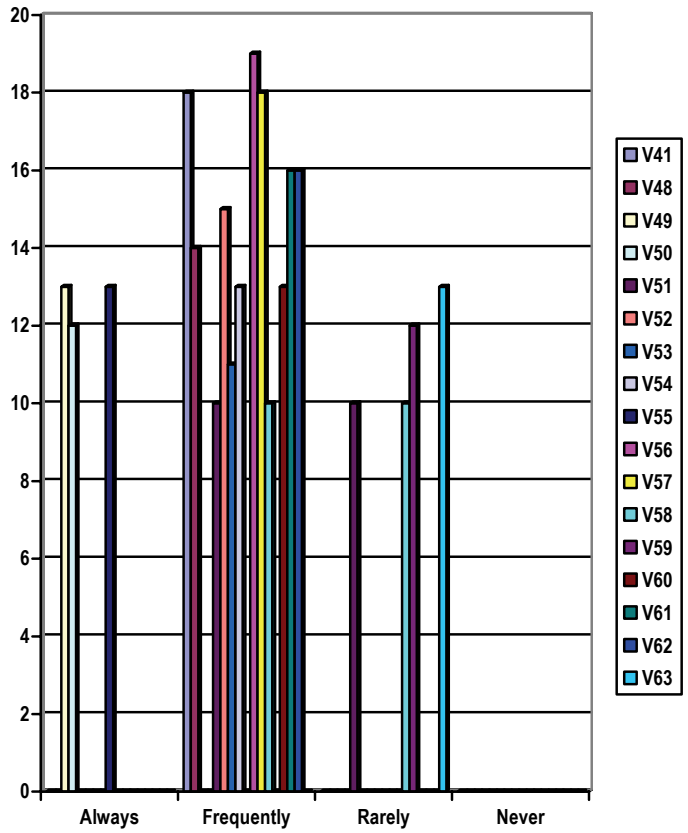
Compiled by the researcher

Figure 5.4 Individual reflection activities

Graphic presentation	Explanation
	The following were rated as **always**: • Thinking about contributions to aviation safety (V45). The following were rated as **frequently**: • Revisiting an air traffic control shift in their minds and thinking about what actually happened during a shift (V41). • Thinking about ways to improve air traffic control skills as a result of a team's opinion concerning personal present performance (V42). • Thinking about ways to improve air traffic control skills as a result of inputs received from others concerning present performance (V43). • Thinking about the social relationships encountered in the work team (V44). • Thinking about own personal values and its role in work life (V46). • Thinking about the expectations of the aviation industry, organisation, centre and team (V47).

Compiled by the researcher

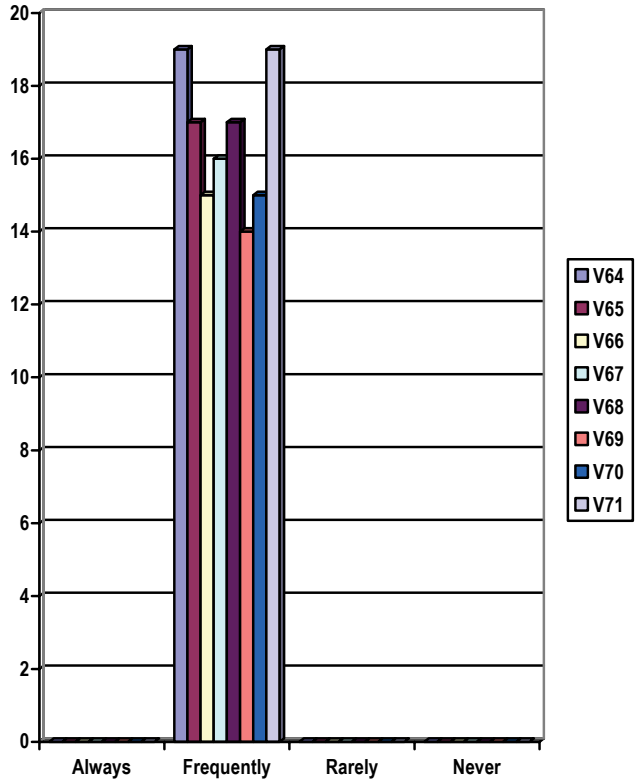
Figure 5.5 Teamwork performance measures

Graphic presentation	Explanation
	The following were rated as **always**: • Using accident occurrences as an indicator to measure air traffic control teamwork performance (V49). • Using application of traffic separation standards as an indicator to measure air traffic control teamwork performance (V50). • Using compliance with unit operational rules as an indicator to measure air traffic control teamwork performance (V55). The following were rated as **frequently**: • Using incident occurrences as an indicator to measure air traffic control teamwork performance (V48). • Using efficient airspace utilisation as an indicator to measure air traffic control teamwork performance (V52). • Using traffic capacity management as an indicator to measure air traffic control teamwork performance (V53). • Using traffic sequencing abilities of the controllers as an indicator to measure air traffic control teamwork performance (V54). • Using quality of team support provided as an indicator to measure air traffic control teamwork performance (V56). • Using individual contributions by team members as an indicator to measure air

	traffic control teamwork performance (V57). • Using handling of emergency situations as an indicator to measure air traffic control teamwork performance (V60). • Using quality of radio-telephony practices as an indicator to measure air traffic control teamwork performance (V61). • Using effectiveness of information (coordination) sharing as an indicator to measure air traffic control teamwork performance (V62). The following were rated equally as **frequently** and **rarely**: • Using number of flight delays as an indicator to measure air traffic control teamwork performance (V51). • Using work overload occurrences as an indicator to measure air traffic control teamwork performance (V58). The following were rated as **rarely**: • Using number of unnecessary requests made to pilots as an indicator to measure air traffic control teamwork performance (V59). • Using number of interpersonal conflict situations as an indicator to measure air traffic control teamwork performance (V63).

Compiled by the researcher

Figure 5.6 Team performance dynamics

Graphic presentation	Explanation
	The following were rated as **frequently**: • Shared judgement calls (V64). • Shared problem-solving actions (V65). • Shared decision-making abilities (V66). • Shared situational awareness (V67). • Similar skill levels (V68). • Shared positive attitudes (V69). • Trust amongst team members (V70). • Shared information amongst team members (V71).

Compiled by the researcher

3.1.2 Self-directed Team Learning results

Self-directed team learning data (V72 – V149) were collected from 25 respondents (N=25). Data analysed are presented in 6 cumulative categories as illustrated in Table 5.17.

Table 5.17 Cumulative data categories

SDTLQ question number	V- numbers	Data category
13	V72-V78	Individual learning preferences
14	V79-V84	Learning participation
15	V85	Individual workplace learning orientation
16	V86-V90	Workplace training design
17	V91-V95	Workplace training implementation
18	V96-V100	Workplace training evaluation
19	V101-V115	Operational training characteristics
20	V116-V130	Continuation training characteristics
21	V131-V141	Workplace learning environment
22	V142-V149	Team learning facilitation

Compiled by the researcher

In order to satisfy my need to describe and compare phenomena I needed to determine which viewpoints held by respondents were reported foremost. Creating this awareness aided understanding of self-directed team learning phenomena from a qualitative perspective. Of interest to me was thus to determine each V-number's modus and associated frequency within each data category. These are presented below.

- Individual learning preferences (V72-V78) are graphically illustrated with reference to modus and frequency in Figure 5.7.

- Learning participation initiatives (V79-V84) are graphically illustrated with reference to modus and frequency in Figure 5.8.

- With respect to individual workplace learning orientation (V85) 15 respondents reported that their own workplace learning experience is externally directed focused (relying on others to assist with own learning).

- Workplace training design responsibilities (V86-V90) are graphically illustrated with reference to modus and frequency in Figure 5.9.

- Workplace training implementation responsibilities (V91-V95) are graphically illustrated with reference to modus and frequency in Figure 5.10.

- Workplace training evaluation responsibilities (V96-V100) are graphically illustrated with reference to modus and frequency in Figure 5.11.

- Operational training characteristics (V101-V115) are graphically illustrated with reference to modus and frequency in Figure 5.12.

- Continuation training characteristics (V116-V130) are graphically illustrated with reference to modus and frequency in Figure 5.13.

- Workplace learning environment characteristics (V131-V141) are graphically illustrated with reference to modus and frequency in Figure 5.14.

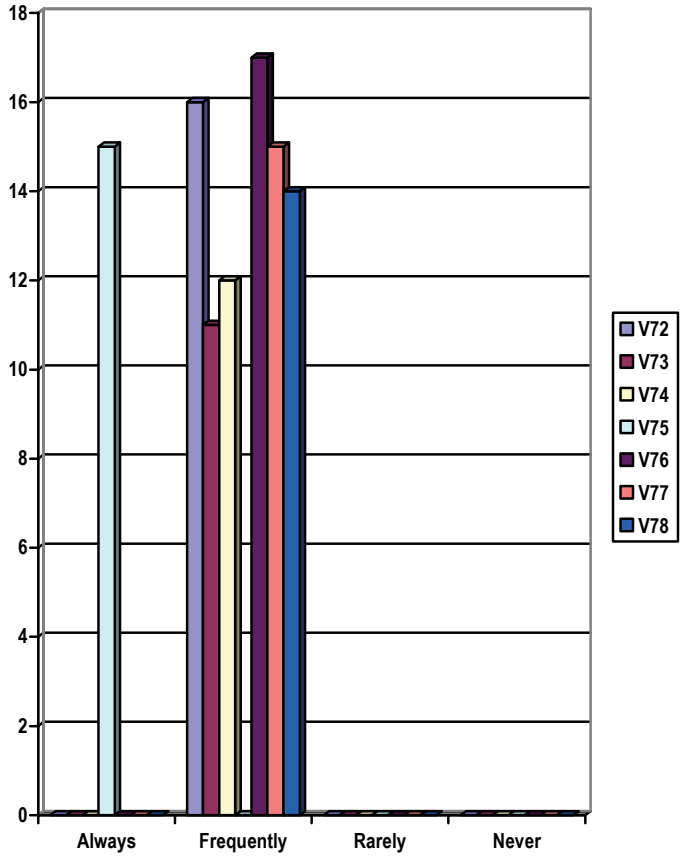
- Team learning facilitation characteristics (V142-V149) are graphically illustrated with reference to modus and frequency in Figure 5.15.

- One respondent provided personal self-directed learning data in response to question 23 (V150). This respondent stated that he/she learns by reflecting on situations and then replaying them in his/her mind to determine what he/she could have done better, and how.

- Two respondents provided team self-directed learning data in response to question 23 (V151).

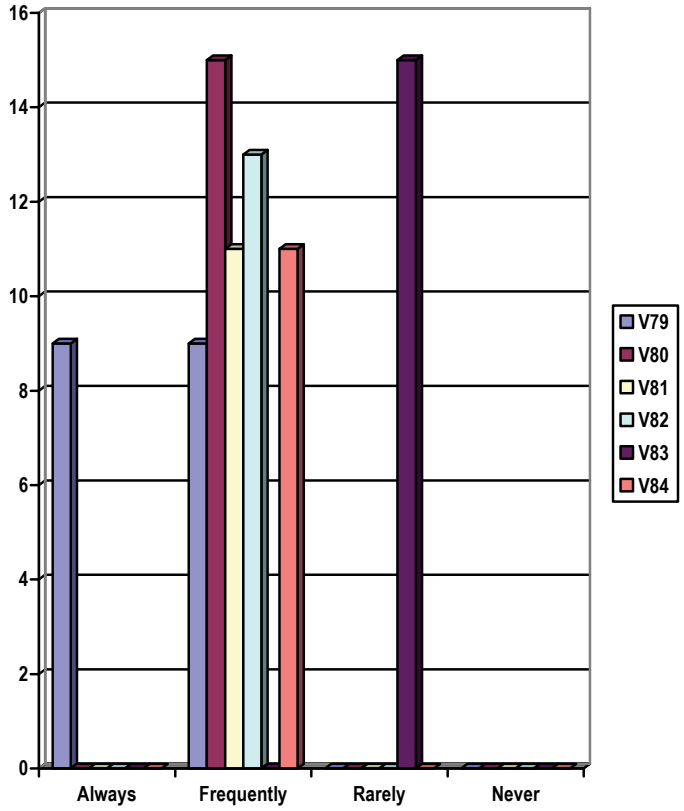
    - One respondent stated that recently trained air traffic controllers require a great deal of "spoon feeding" from other team members in order to ensure competence of these junior controllers.
    - A second respondent commented that a lack of experience is apparent amongst senior team members.

Figure 5.7 Individual learning preferences

Graphic presentation	Explanation
	The following were rated as **always**: • Preference to learn as a result of curiosity (V75). The following were rated as **frequently**: • Preference to learn as a result of novel, difficult and unfamiliar air traffic control problem situations (V72). • Preference to learn as a result of routine and expected air traffic control situations (V73). • Preference to learn as a result of familiar and trained-for air traffic control problem situations (V74). • Preference to learn as a result of feedback received from others (V76). • Preference to learn as a result of an own diagnosis of learning needs (V77). • Preference to learn as a result of a systematic and sequential learning plan that is provided (V78).

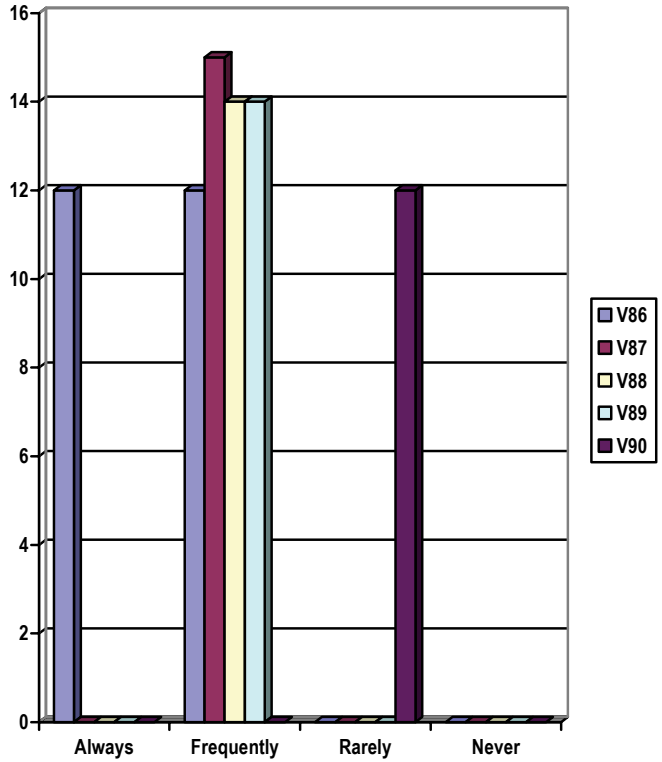
Compiled by the researcher

Figure 5.8 Learning participation initiatives

Graphic presentation	Explanation
	The following was rated equally as **always** and **frequently**: • Participation in formal team discussions at their air traffic control centre (V79). The following were rated as **frequently**: • Participation in informal team discussions at air traffic control centres (V80). • Participation in formal individual feedback sessions (example: a structured one-to-one discussion) at air traffic control centres (V81). • Participation in informal individual feedback sessions (example: a semistructured or unstructured one-to-one discussion) at air traffic control centres (V82). • Participation in critically analysing and reflecting upon own performance at air traffic control centres (V84). The following was rated as **rarely**: • Participation in setting of learning contracts/agreements at air traffic control centres (V83).

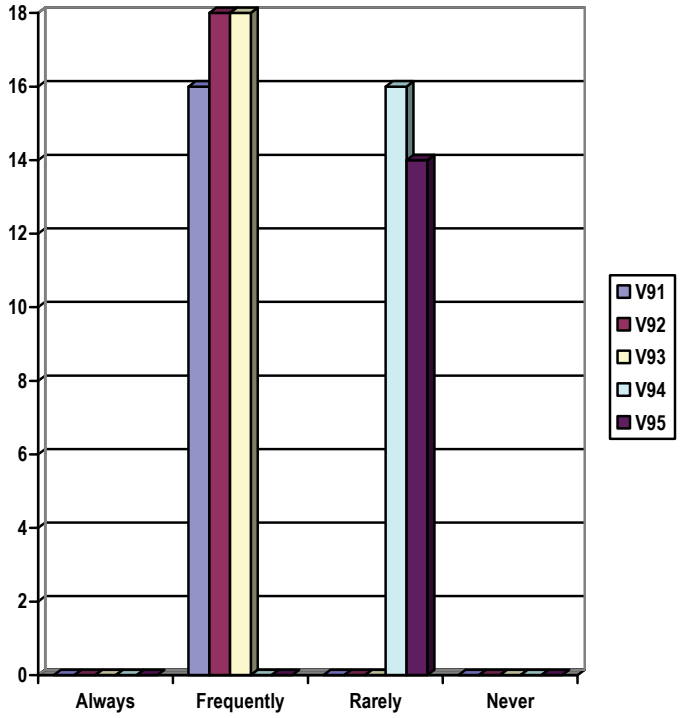
Compiled by the researcher

Figure 5.9 Workplace training design responsibilities

Graphic presentation	Explanation
	The following was rated equally as **always** and **frequently**: • Air traffic control training objectives for the air traffic control team are decided upon by the chief air traffic control officer (V86). The following were rated as **frequently**: • Air traffic control training objectives for the air traffic control team are decided upon by the senior air traffic control officer (V87). • Air traffic control training objectives for the air traffic control team are decided upon by the air traffic control training officer (V88). • Training objectives for the air traffic control team are decided upon by the air traffic control team (V89). The following was rated as **rarely**: • Air traffic control training objectives for the air traffic control team are decided upon by individual air traffic controllers (V90).

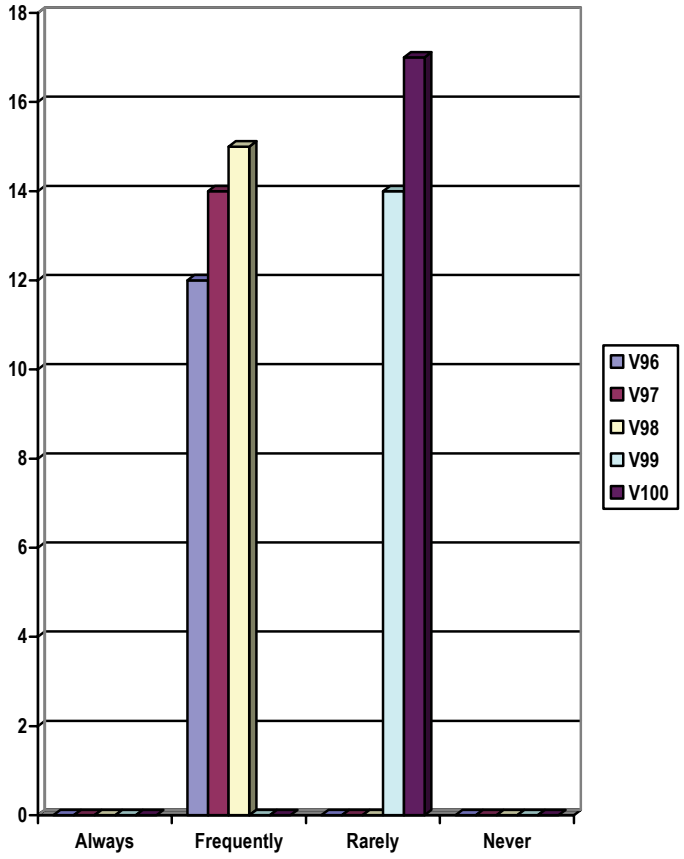
Compiled by the researcher

Figure 5.10 Workplace training implementation responsibilities

Graphic presentation	Explanation
	The following were rated as **frequently**: • Chief air traffic control officer presents air traffic control training initiatives to the air traffic control team at the centre (V91). • Senior air traffic control officers present air traffic control training initiatives to the air traffic control team at the centre (V92). • Air traffic control training officers present air traffic control training initiatives to the air traffic control team at the centre (V93). The following were rated as **rarely**: • Air traffic control team members present air traffic control training initiatives to the air traffic control team at the centre (V94). • Individual air traffic controllers present air traffic control training initiatives to the air traffic control team at the centre (V95).

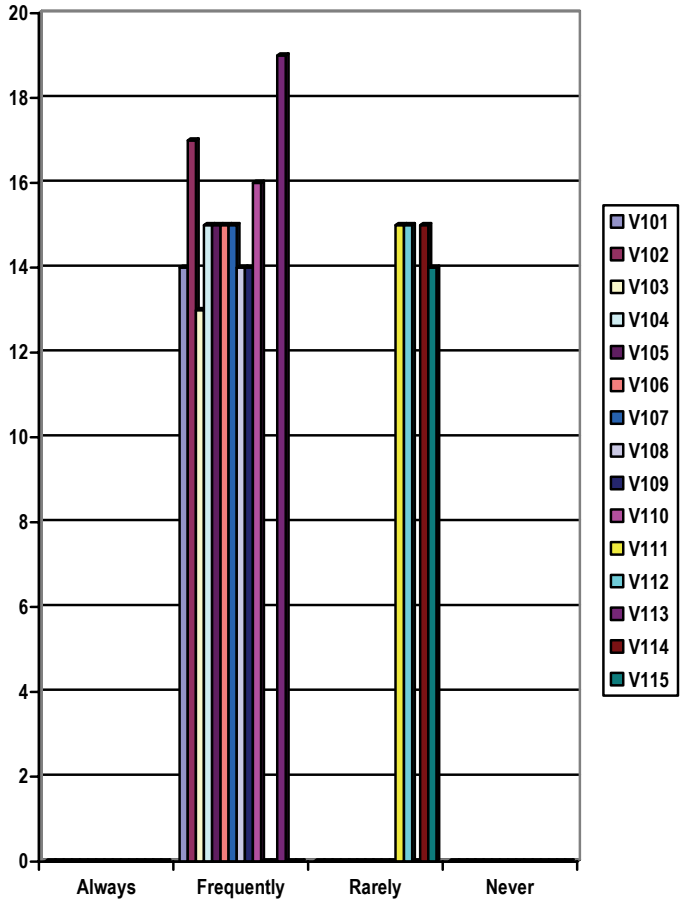
Compiled by the researcher

Figure 5.11 Workplace training evaluation responsibilities

Graphic presentation	Explanation
	The following were rated as **frequently**: • A chief air traffic control officer evaluates air traffic control training initiatives presented to air traffic control teams at the centre (V96). • Senior air traffic control officers evaluate air traffic control training initiatives presented to air traffic control teams at the centre (V97). • Air traffic control training officers evaluate air traffic control training initiatives presented to air traffic control teams at the centre (V98). The following were rated as **rarely**: • All air traffic control team members evaluate air traffic control training initiatives presented to air traffic control teams at the centre (V99). • Individual air traffic controllers evaluate air traffic control training initiatives presented to air traffic control teams at the centre (V100).

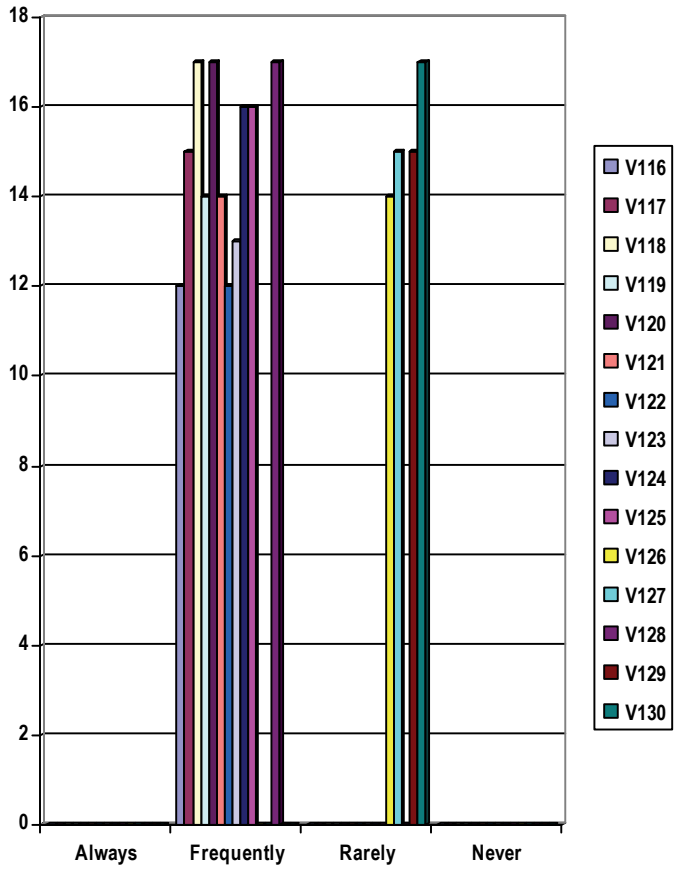
Compiled by the researcher

Figure 5.12 Operational training characteristics

Graphic presentation	Explanation
	The following were rated as **frequently**: • Passing information to team members who need it, before they need it (V101). • Identifying the need to assist other team members (V102). • Encouraging team members to communicate their observations (V103). • Encouraging team members to communicate their concerns (V104). • Encouraging team members to communicate their suggestions (V105). • Encouraging team members to communicate their requests (V106). • Learning to adapt performance strategies quickly as a result of changing demands (V107). • Learning to adapt performance strategies appropriately to changing task demands (V108). • Knowledge of tasks performed by all air traffic control positions (V109). • Team situational awareness skills (V110). • Coordination activities and processes (V113). The following were rated as **rarely**: • Stress coping strategies (V111). • Getting to know team members at a personal level (V112). • Fostering mutual trust (V114). • Creating team cohesion (V115).

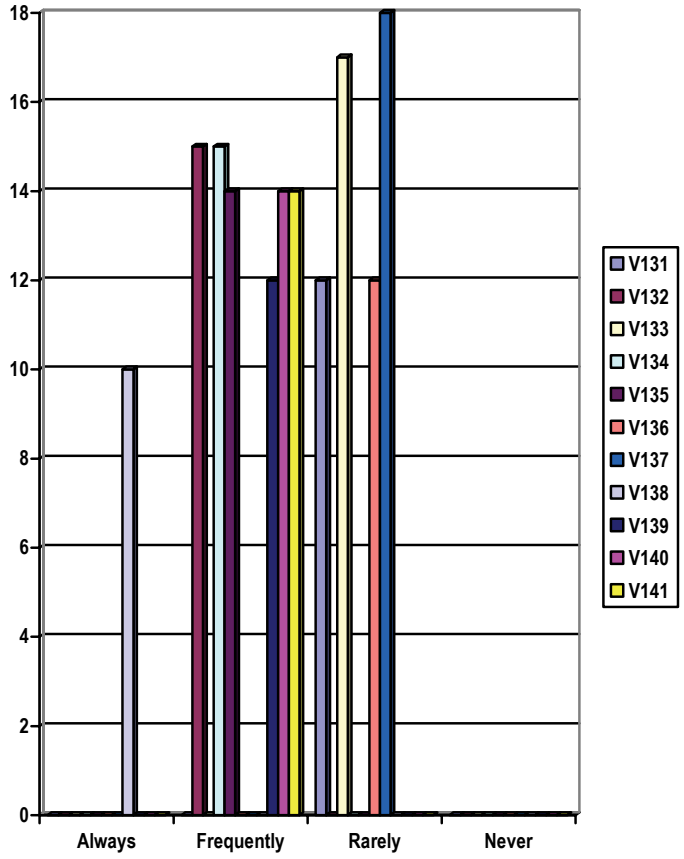
Compiled by the researcher

Figure 5.13 Continuation training characteristics

Graphic presentation	Explanation
	The following were rated as **frequently**: • Passing information to team members who need it, before they need it (V116). • Identifying the need to assist other team members (V117). • Encouraging team members to communicate their observations (V118). • Encouraging team members to communicate their concerns (V119). • Encouraging team members to communicate their suggestions (V120). • Encouraging team members to communicate their requests (V121). • Learning to adapt performance strategies quickly as a result of changing demands (V122). • Learning to adapt performance strategies appropriately to changing task demands (V123). • Knowledge of tasks performed by all air traffic control positions (V124). • Team situational awareness skills (V125). • Coordination activities and processes (V128). The following were rated as **rarely**: • Stress coping strategies (V126). • Getting to know team members at a personal level (V127). • Fostering mutual trust (V129). • Creating team cohesion (V130).

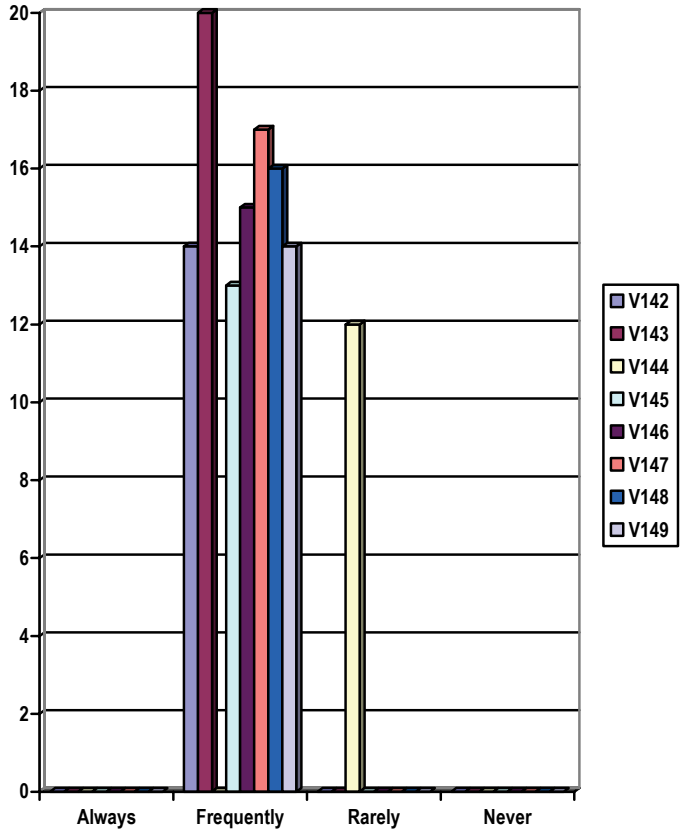
Compiled by the researcher

Figure 5.14 Workplace learning environment characteristics

Graphic presentation	Explanation
	The following was rated as **always**: • Support from management to encourage team members to learn from workplace experiences (V138). The following were rated as **frequently**: • Team members that ensure that learning does take place within the team (V132). • Planned continuation training events (V134). • Ad hoc lectures/presentations (V135). • Adequate resources to facilitate learning (V139). • An open forum that encourages discussion and sharing of experiences amongst team members (V140). • Team members that will plan their own learning when the need arises (V141). The following were rated as **rarely**: • Weekly planned learning sessions (V131). • Use of learning contracts/agreements (V133). • Social gatherings where work related matters are discussed in an informal manner (V136). • Social gatherings where work related matters are discussed in a formal manner (V137).

Compiled by the researcher

Figure 5.15 Team learning facilitation characteristics

Graphic presentation	Explanation
	The following were rated as **frequently**: • A supportive team learning atmosphere (V142). • Known team roles and responsibilities (V143). • A shared motivation to learn (V145). • Pre-planning for learning (V146). • Guiding leadership support (V147). • Adequate resource availability (V148). • Participation from experienced team members (V149). The following was rated as **rarely**: • Sensitivity towards personality differences (V144).

Compiled by the researcher

3.1.3 Team performances and self-directed team learning relationship results

A statistical view was regarded as noteworthy in order to investigate the possibility of a relationship between self-directed team learning and self-directed team performance for each team. An understanding of any reciprocating association between team performance and team learning as illustrated by an analysis of SDTLQ data was thus sought.

For each respondent in team 1 (9 respondents), in team 2 (7 respondents) and in team 3 (9 respondents) self-directed team performance means (defined as SDPM) were calculated for V12 to V25 (team work characteristics), V27 to V40 (team performance activities), V41 to V47 (individual reflection), V48 to V63 (team work performance measures) and V64 to V71 (team performance dynamics). Similarly self-directed team learning means (defined as SDLM) were calculated for V72 to V78 (individual learning preferences), V79 to V84 (learning participation), V86 to V90 (workplace training design), V91 to V95 (workplace training implementation), V96 to V100 (workplace training evaluation), V101 to V115 (operational training characteristics), V116 to V130 (continuation training characteristics), V131 to V141 (workplace learning environment), and V142 to V149 (team learning facilitation) for each respondent in team 1, in team 2 and in team 3.

In order to test, for each team, whether there is a statistically significant difference between team performance and team learning a difference variable was calculated by subtracting self-directed team learning means from self-directed team performance means. For each team, Shapiro-Wilk tests for normality suggested a normal distribution for the differences. Therefore a t-test could be used to test the null hypothesis that the mean difference between the SDPM and SDLM equal zero against the alternative that the mean difference is unequal to zero. Table 5.18 presents the mean difference between SDPM and SDLM, the Standard deviation (SD) of the difference, and the t-statistic (two-sided t-test) and *p* value for testing for a difference between self-directed team learning means and self-directed team performance means.

Table 5.18 Mean difference, Standard deviation (SD) of difference, and t-statistic and *p*-value for testing for a difference between self-directed team learning means and self-directed team performance means

Dimension		Sample size (n)	Mean difference	SD of difference	t-statistic	*p-value*	Effect size
1	Team 1	9	0.117	0.14	2.46	0.0391*	0.63
2	Team 2	7	0.088	0.22	1.07	0.3248	0.31
3	Team 3	9	0.349	0.17	6.02	0.0003*	1.38

*: Statistically significant at the 5% level of significance

Clearly, for team 1 and team 3, the null hypothesis could be rejected at the 5% level of significance. However, this was not the case for team 2. Furthermore, the corresponding effect sizes suggest practical significance. I concluded that a relationship existed between self-directed team learning and self-directed team performance for teams 1 and 3. However, in the light of the small samples the results were viewed with extreme circumspection.

3.1.4 Continuation training results

In this section continuation training differences reported in the SDTLQ (reference V116 to V130 as completed by the three teams) were statistically analysed. This analysis was conducted in lieu of the potential and value of continuation training when considering the sustainability of self-directed team learning within this workplace. An analysis of variance (ANOVA) was used to determine whether differences in continuation training between the three teams existed. The *p*-value (0.6087) was larger than .05 considered in this case. From Table 5.19 it follows that no statistical difference between the three continuation training means existed.

Table 5.19 Results of ANOVA for the continuation training (CT) differences (dependent variable) between the three teams (Least Squares Means, LSM, used for multiple comparisons)

	Teams						*p*-value
	1		2		3		
	LSM	Std Error	LSM	Std Error	LSM	Std Error	0.6087
CT	2.75	0.15	2.92	0.17	2.71	0.15	

ANOVA and post hoc comparisons indicate no statistically significant differences between the three teams regarding continuation training. Clearly, no statistically significant differences existed between the three teams in terms of continuation training (CT). Thus one cannot use continuation training (CT) to distinguish between the three teams.

3.2 Team learning approaches and self-directed team relationship results

The focus and purpose of the SDTLQ and LAQ differed, however, essentially they endeavoured to measure aspects of team learning dynamics within a defined workplace. I realised that this possibility of a latent difference may require further investigation. Findings may possibly have some bearing on qualitative data analysis. Hence I determined whether a relationship could be traced between learning approaches from the LAQ (Table 5.20) and the self-directed team performance and self-directed team learning from the SDTLQ.

Table 5.20 Learning approaches described by the LAQ

Learning approaches in terms of learning content (LAQc)							
Deep approach (DA)		Achievement approach (AA)		Self-efficacy (SE)	Surface approach (SA)		
Strategy (DS)	Motive (DM)	Strategy (AS)	Motive (AM)		Strategy (SS)	Motive (SM)	Fear of failure (FF)
Learning approaches in terms of social orientations when learning (LAQs)							
Dependent (DEPEN)		Independent (INDEPEN)		Inter-dependent			
				Competitive (COMP)		Cooperative (COOP)	

Adapted by the researcher from Schaap (2000: 556)

This paragraph elaborates on information relating to LAQ criteria presented in Table 5.20 and LAQ relationships. The LAQ allowed for measurement of learning approaches in terms of learning content (LAQc) and social orientations (LAQs). The **LAQc** allowed for measurement of learning approaches in terms of learning content, consisting of deep approaches (DA), achievement approaches (AA), surface approaches (SA) and self-efficacy (SE). A deep approach (DA) is synonymous with the use of appropriate deep learning strategies (DS) in relation to an individual's motives (DM) (Schaap, 2000: 556). An achievement approach (AA) refers to achievement learning strategies (AS) in relation to an individual's motives (AM) (Schaap, 2000: 556). According to Schaap (2000: 556) effective learning also relies on high

scores for self-efficacy (SE) and low scores for fear of failure (FF). Fear of failure (FF) is grouped as with surface learning strategy (SS) and an individual's motives (SM) under surface approach to learning (SA) (Schaap, 2000: 556). Schaap (2000: 556) states that the higher the deep approach (DA) and achievement approach (AA) dimensions are relative to the surface approach (SA), the more effective learning is resembled. The **LAQs** measured dependent (DEPEN), independent (INDEPEN), and inter-dependent learning approaches in terms of social orientations in a learning situation (Schaap, 2000: 556). An inter-dependent learning approach comprises cooperative (COOP) and competitive (COMP) learning approaches in terms of social orientations in a learning situation (Schaap, 2000: 556). An ideal learning approach within group learning situations requires distinct cooperative (COOP) and independent (INDEPEN) orientations (Schaap, 2000: 556). Orientations strongly supporting competitiveness (COMP) and dependency (DEPEN) do not allow for an ideal group learning approach (Schaap, 2000: 556).

This paragraph provides a description of the SDTLQ criteria. Self-directed team performance means (defined as **SDPM**) were calculated for V12 to V25 (team work characteristics), V27 to V40 (team performance activities), V41 to V47 (individual reflection), V48 to V63 (team work performance measures) and V64 to V71 (team performance dynamics) for each team. Self-directed team learning means (defined as **SDLM**) were calculated for V72 to V78 (individual learning preferences), V79 to V84 (learning participation), V86 to V90 (workplace training design), V91 to V95 (workplace training implementation), V96 to V100 (workplace training evaluation), V101 to V115 (operational training characteristics), V116 to V130 (continuation training characteristics), V131 to V141 (workplace learning environment), and V142 to V149 (team learning facilitation) for each team. Four relationship categories were identified. Relationship categories for each of the three teams were calculated by using Spearman's correlation coefficient. These categories consisted of the following:

1. LAQc (learning approaches in terms of content) as derived from the LAQ correlated and self-directed team performance (SDPM) as derived from the Self-directed Team Learning Questionnaire;
2. LAQc (learning approaches in terms of content) as derived from the LAQ correlated and self-directed team learning (SDLM) as derived from the Self-directed Team Learning Questionnaire;
3. LAQs (learning approaches in terms of social orientations when learning) as derived from the LAQ correlated and self-directed team performance (SDPM) as derived from the Self-directed Team Learning Questionnaire; and

4. LAQs (learning approaches in terms of social orientations when learning) as derived from the LAQ correlated and self-directed team learning (SDLM) as derived from the Self-directed Team Learning Questionnaire.

The Spearman correlation coefficient was used because it measures whether there is a monotone increasing/decreasing relation between the two variables (linear or non-linear); unlike the Pearson correlation coefficient that measures the linear relationship between two variables. Spearman correlations were calculated between the variables SDPM and SDLM with the LAQc and LAQs variables separately. In cases where *p*-value ≤ .05, the null hypothesis (no correlation exists between the pair of variables for which the correlation coefficient is given) can be rejected.

LAQ variables were presented as percentile-variables (with reference to P-variables; for example PCOOP) and stanine variables (with reference to S-variables; for example SCOOP). P-variables took on values of 1, 2 & 3, and were deemed unsuitable for correlation in this respect. **Variables considered for this analysis were LAQ S-variables because they took on integer values from 1 to 9**. 16 LAQ S-variables were analysed for each team. Significance was set at the 5% level. All Spearman correlation coefficients between LAQc and SDPM and SDLM; and LAQs and SDPM and SDLM (only considering LAQ S-variables) for teams 1, 2 and 3 are presented in Appendix G. Noteworthy correlations and the corresponding *p*-values for *p* are presented in Table 5.21.

Table 5.21 Spearman correlation coefficients between LAQc and SDPM and SDLM; and LAQs and SDPM and SDLM (only considering LAQ S-variables) with corresponding *p*-values

				SDTLQ	
Team	**n**	**LAQ (S-variables)**	**LAQ description**	**SDPM**	**SDLM**
Team 1	9	SCOOP	Cooperative interdependent learning approach in terms of social orientation	**r = 0.9613** ***p* < 0.0001***	**r = 0.7352** ***p* = 0.0240***
Team 2	7	SDS	Deep learning approach strategy in terms of learning content	r = 0.4304 *p* = 0.3351	**r = 0.7671** ***p* = 0.0441***
		SDM	Deep learning approach motive in terms of learning content	r = -0.0181 *p* = 0.9691	**r = 0.8728** ***p* = 0.0103***
		SDA	Deep learning approach in terms of learning content	r = 0.1853 *p* = 0.6908	**r = 0.7783** ***p* = 0.0393***

		SSE	Self-efficacy learning approach in terms of learning content	r = -0.1889 *p* = 0.6849	**r = 0.9449** ***p* = 0.0013***
		SDAAASE	Deep-achieving approach to learning	r = 0.0197 *p* = 0.9666	**r = 0.8078** ***p* = 0.0280***
		SCOOP	Cooperative interdependent learning approach in terms of social orientation	r = 0.1101 *p* = 0.8142	**r = 0.8994** ***p* = 0.0058***
Team 3	9	SDM	Deep learning approach motive in terms of learning content	**r = 0.7378** ***p* = 0.0232***	r = 0.5027 *p* = 0.1677
		SDA	Deep learning approach in terms of learning content	**r = 0.6900** ***p* = 0.0397***	**r = 0.8142** ***p* = 0.0075***
		SAM	Achievement learning approach motive in terms of learning content	r = 0.4546 *p* = 0.2188	**r = 0.7199** ***p* = 0.0287***
		SFF	Fear of failure in terms of surface approach to learning content	**r = -0.9139** ***p* = 0.0006***	**r = -0.6817** ***p* = 0.0431***
		SINDEPEN	Independent learning approach in terms of social orientation	**r = 0.8306** ***p* = 0.0056***	**r = 0.7638** ***p* = 0.0166***

r is the correlation coefficient and ***p*** is the corresponding *p*-value

*: $p \leq .05$ (statistically significant at the 5% level of significance)

In the following discussion conclusions are presented where the null hypothesis (which stated that no correlation[9] existed between the pair of variables for which the correlation coefficient was given) was rejected[10].

- In **team 1** a cooperative interdependent learning approach (COOP) in terms of social orientation (from the LAQ) correlated with self-directed team performance (SDPM) and self-directed team learning (SDLM) as derived from the Self-directed Team Learning Questionnaire. From Table 5.21 and the accompanying LAQ description[11] it was clear that the cooperative approach to learning illustrated a social orientation in terms of group learning within team 1. The cooperative approach to learning also showed a relationship with self-directed team performance criteria and self-directed team learning criteria as described in the SDTLQ's SDPM and SDLM[12].

[9] In this discussion use of the terms "correlated" and "correlation" implied statistical significance at the 5% level of significance.
[10] Statistical analysis and results reported were verified by the author of the LAQ (reference: Appendix H).
[11] LAQ criteria and relationships are described on page 319.
[12] SDTLQ Self-directed team performance criteria are described on page 320.

It can be concluded that in the case of team 1 a cooperative interdependent learning approach within a social learning orientation supported self-directed performance and learning criteria.

- In **team 2** a deep approach (DA) to learning {inclusive of strategy (DS) and motive DM)} resulted in a deep approach in terms of learning content (DAAASE). The deep approach in terms of learning content correlated with self-directed team learning (SDLM) as derived from the SDTLQ[13]. A self-efficacy learning approach (SE) in terms of learning content (from the LAQ[14]) correlated with self-directed team learning (SDLM) as derived from the Self-directed Team Learning Questionnaire. A cooperative interdependent learning approach (COOP) in terms of social orientation (from the LAQ) also correlated with self-directed team learning (SDLM) as derived from the SDTLQ.

  In the case of team 2 a deep approach in terms of learning content (DAAASE) supported by a self-efficient learning approach (SE) showed a relationship with the SDTLQ's SDLM. In this regard Schaap (2000: 556) stated that a self-efficient learning approach (SE) combined with a deep learning approach contribute towards effective learning (Schaap, 2000: 556). The deep approach in terms of learning content reported by team 2 was also supported by a cooperative interdependent learning approach (COOP) in terms of social orientation (from the LAQ). In this case a favourable learning approach within group learning situations can be expected (Schaap, 2000: 556). It can thus be concluded that in the case of team 2 the LAQ criteria listed in this paragraph were considered to be supportive of self-directed team learning.

- In **team 3** a deep learning approach (DA) correlated with self-directed team performance (SDPM) and learning (SDLM) from the SDTLQ[15]. It was also found that a deep learning approach motive (DM) correlated with self-directed team performance (SDPM). Achievement learning approach motive (AM) in terms of learning content correlated with self-directed team learning (SDLM). Fear of failure (FF) correlated negatively with self-directed team performance (SDPM) and learning (SDLM). An independent learning approach (INDEPEN) in terms of social orientation (from the LAQ[16]) correlated with self-directed team performance (SDPM) and learning (SDLM). This

[13] SDTLQ Self-directed team performance criteria are described on page 320.
[14] LAQ criteria and relationships are described on page 319.
[15] SDTLQ Self-directed team performance criteria are described on page 320.
[16] LAQ criteria and relationships are described on page 319.

independent approach to learning illustrated a social orientation in terms of group learning within team 3.

According to Schaap (2000: 556) a positive relationship has been demonstrated between a deep learning approach (DA) and an independent learning approach (INDEPEN). Schaap (2000: 556) agrees that a negative correlation in terms of fear of failure (FF) should support effective learning. It can thus be concluded that in the case of team 3 the LAQ criteria listed in this paragraph were considered to be supportive of self-directed team performance and self-directed team learning.

In summary 12 LAQ S-variables from the 48 LAQ S-variables analysed allowed for the rejection of the null hypothesis (which stated that no correlation existed between the pair of variables for which the correlation coefficient was given) at a 5% level of significance. It is possible to conclude that a broad-spectrum relationship existed between focal points of the LAQ and the SDTLQ when considering team learning approaches (both learning content and social orientations when learning) and self-directed team learning results (both self-directed team performance and self-directed team learning). Within these three teams statistically significant (at the 5% level of significance) relationship categories were all in support of self-directed team learning criteria and/or self-directed team learning criteria. As a result statistical significant relationships (statistically significant at the 5% level of significance) identified in Table 5.21 were considered to be supportive of learning approaches that sustained self-directed team learning and self-directed team performances.

4 Conclusion

Conclusion 

In this chapter the data analysis and presentation of results that formed the main focus of this study were discussed. Qualitative results, which relied upon individual interview data and focus group interview data, were reported during the first phase. This first phase was followed by quantitative results, which relied upon Self-directed Team Learning Questionnaire (SDTLQ) and Learning Approach Questionnaire (LAQ) data.

During the analysis of data collected at the three research sites I observed a likely relationship between qualitative results and quantitative results. In my opinion this relationship was the result of similarities found

in team performance, self-directed learning and continuation training focus areas. I concluded that this perceived relationship between inductive qualitative data analysis and the SDTLQ indicators (quantitative data), which relied upon deductive data analysis may have contributed towards content-related validity and trustworthiness.

In Chapter 6 findings are discussed further and results are contextualised.

CHAPTER 6

DISCUSSION OF FINDINGS AND CONTEXTUALISING RESULTS

		Page
1	**Introduction**	329
2	**Findings**	329
2.1	Self-directed air traffic control **team performance** results	330
2.1.1	Aspects identified that advanced my understanding of self-directed air traffic control team performance results	331
2.1.2	Relationships inferred from an analysis of self-directed air traffic control team performance results	333
2.1.3	Reported practices that influenced my understanding of self-directed air traffic control team performance results	334
2.1.4	Summary	335
2.2	Self-directed air traffic control **team learning** results	335
2.2.1	Aspects identified that advanced my understanding of self-directed team learning dynamics within self-managed air traffic control teams	336
2.2.2	Relationships inferred from an analysis of self-directed team learning dynamics within self-managed air traffic control teams	338
2.2.3	Reported practices that influenced my understanding of self-directed team learning dynamics within self-managed air traffic control teams	341
2.2.4	Summary	342
2.3	**Future/continued** air traffic control **team learning possibilities**	342
2.3.1	Aspects identified that advanced my understanding of future/continued air traffic control team learning possibilities	343
2.3.2	Relationships inferred from an analysis of future/continued air traffic control team learning possibilities	344
2.3.3	Reported practices that influenced my understanding of future/continued air traffic control team learning possibilities	345

2.3.4 Summary 345

3 Contextualising results 346

4 Synthesis 347

Figure 6.1 Chapter 6 orientation

Introduction		
Findings	Self-directed air traffic control team performance results	Aspects identified that advanced my understanding of self-directed air traffic control team performance results
		Relationships inferred from an analysis of self-directed air traffic control team performance results
		Reported practices that influenced my understanding of self-directed air traffic control team performance results
		Summary
	Self-directed air traffic control team learning results	Aspects identified that advanced my understanding of self-directed team learning dynamics within self-managed air traffic control teams
		Relationships inferred from an analysis of self-directed team learning dynamics within self-managed air traffic control teams
		Reported practices that influenced my understanding of self-directed team learning dynamics within self-managed air traffic control teams
		Summary
	Future/continued air traffic control team learning possibilities	Aspects identified that advanced my understanding of future/continued air traffic control team learning possibilities
		Relationships inferred from an analysis of future/continued air traffic control team learning possibilities
		Reported practices that influenced my understanding of future/continued air traffic control team learning possibilities
		Summary
Contextualising results		
Synthesis		

Compiled by the researcher

1 Introduction

Introduction

In this chapter findings are discussed and results are contextualised. I realised that this phase will require high standards of objectivity and systematic reporting.

My reporting was therefore guided by a comparative approach. Firstly findings that originated from different data sources were compared within the boundaries of each research question. Secondly these findings were integrated and then compared with theoretical understanding. Finally results were contextualised and synthesised in order to present my understanding of the findings. This comparative approach also allowed for triangulation.

My interpretations presented in this chapter were directed by my conceptual orientation. A point of departure followed by me was that there are multiple interpretations of, and perspectives on single events and situations (Cohen, Manion & Morrison, 2000: 22). McMillan and Schumacher (2001: 463) are in agreement that most qualitative researchers lean more toward the interpretivist/subjectivist and less towards the technical/objectivist style. **Analysing qualitative data is described by McMillan and Schumacher (2001: 463 & 464) as an eclectic activity and the researcher must accept that there is no one "right way" and data can be analysed in more than one way.**

These inductive analysis views expressed by Cohen, Manion and Morrison (2000: 22) and McMillan and Schumacher (2001: 463) guided my reporting conduct. Phenomena were reported within its real life contexts in order to explore views, meanings, experiences, accounts, actions and events that had transpired.

2 Findings

Findings	Self-directed air traffic control team performance results	Aspects identified that advanced my understanding of self-directed air traffic control team performance results
		Relationships inferred from an analysis of self-directed air traffic control team performance results
		Reported practices that influenced my understanding of self-directed air traffic control team performance results
		Summary

	Self-directed air traffic control team learning results	Aspects identified that advanced my understanding of self-directed team learning dynamics within self-managed air traffic control teams
		Relationships inferred from an analysis of self-directed team learning dynamics within self-managed air traffic control teams
		Reported practices that influenced my understanding of self-directed team learning dynamics within self-managed air traffic control teams
		Summary
	Future/continued air traffic control team learning possibilities	Aspects identified that advanced my understanding of future/continued air traffic control team learning possibilities
		Relationships inferred from an analysis of future/continued air traffic control team learning possibilities
		Reported practices that influenced my understanding of future/continued air traffic control team learning possibilities
		Summary

Findings resulting from data analysed in Chapter 5 are discussed with reference to the following categories:

- Self-directed team performance results.
- Self-directed learning results.
- Future/continued team learning possibilities.

These discussions were guided by the following key questions associated with this impact study (Readership Institute, 2005: 1):

- What features were identified to advance and enhance understanding of the research focus area(s)?
- What relationships were inferred between aspects/elements that are being studied?
- How did observed practices influence the research focus area(s)?

2.1 Self-directed air traffic control team performance results

Air traffic controller behaviours and performances are directed by specific rules, regulations, instructions, procedures and a common team objective; namely aviation safety (Barbarino & Isaac, 2000: 271 and Manning, 2000: 257). Such an important team objective/vision suggests adherence to self-directed team performance principles and conditions. Creating understanding in this regard required an investigation of the nature of air traffic control teams' collective/team mental models and tracing the associated success/impact thereof upon air traffic control operations (Cannon-Bowers, Salas & Converse, 1993:

221-246 and Hacker, Dunlosky & Graesser, 1998: 20). The impact of identified behaviours and performances on air traffic control operations observed from an individual, collective and organisational perspective is accordingly reported in this section[1].

Self-directed air traffic control team performance should ultimately be aimed at achieving results that support aviation safety and illustrate the importance of teamwork within a community of practice (Smith-Jentsch, Zeisig, Cannon-Bowers & Salas, 1997: 201-206 and ATNS, 2003: 20). Key questions driving an impact study (Readership Institute, 2005: 1) were adapted in order to facilitate this discussion of self-directed team performance results. These questions are presented below and associated discussions of findings are offered in paragraphs 2.1.1, 2.1.2, 2.1.3 and 2.1.4.[2]

- What aspects were identified that advanced understanding of self-directed team performance results?
- What relationships were inferred between aspects/elements that resulted from an analysis of self-directed team performance results?
- How did reported practices influence my understanding of self-directed team performance results?

2.1.1 Aspects identified that advanced my understanding of self-directed air traffic control team performance results

Self-directed work teams are multiskilled and take on the responsibilities of the work while realising the importance of continuously developing skills and knowledge of team members (Irwin & Rocine, 1994: 10, Schmidt and Moust, 2000: 21-23 and Williams, 2004: 1-5). Reported attitudes displayed by team members supported a belief in the importance of teamwork in order to ensure efficient air traffic control operations (Table 5.10 *teamwork characteristics and teamwork activities*; Table 5.13 *teamwork characteristics* and Figures 5.3 & 5.4). Team members were in agreement that the air traffic control work team was not more important than team members (Figure 5.2).

From my study I found that power was shared amongst team members, individual contributions were encouraged and internal commitment amongst members was present (Table 5.10 *teamwork characteristics*

[1] With reference to Chapter 5 Tables 5.10 and 5.13 (Results: Impact of teamwork on air traffic control workplace performance outcomes) and Figures 5.2 to 5.6 (Self-directed team performance results).
[2] Subcategories are included as part of references to Tables 5.10 and 5.13 (for example: Table 5.10 *teamwork characteristics* – in this regard reference is made to Table 5.10 and specifically the subcategory titled "teamwork characteristics").

and Table 5.13 *teamwork characteristics and self-efficacy*). These findings corresponded with Smith-Jentsch, Zeisig, Cannon-Bowers and Salas' (1997: 201-206), ATNS (2003: 22) and ICAO's (2001: 2.1) views that an air traffic control team has a shared common purpose regarding the goals and functions of such a team.

Air traffic control team performance was influenced by commonly understood and introduced teamwork performance measures that encouraged effective teamwork dynamics (Table 5.10 *teamwork performance measures* and Figure 5.5). Teamwork performance measures were described in terms of implemented air traffic control practices (including compliance with unit operational rules and separation standards) and team performance support occurrences within this community of practice (Table 5.10 *teamwork performance measures* and Figures 5.3 & 5.5). Reports applicable to air traffic control operational output features considered during performance evaluation included incident reports, airspace efficiency measures, team performance indicators, communication breakdowns and emergency management assessments (Table 5.10 *teamwork characteristics and teamwork performance measures*; Table 5.13 *teamwork characteristics* and Figure 5.5). These team performance findings revealed that teams have knowledge of individual and team performance problems, associated impact indicators and means to identify/predict these problems was evident. These team performance reports pointed towards the existence of a collective/team mental model (Cannon-Bowers, Salas & Converse, 1993: 221-246).

Team members rarely attempted to understand why colleagues behave in certain ways (Figure 5.2). This may point towards a prevailing sense of confidence in a team's collective ability (Smith-Jentsch, Zeisig, Cannon-Bowers and Salas, 1997: 201-206 and Rouse & Morris, 1986: 349-363). Reports were also received that status differences within teams were viewed as an inhibiting factor (Table 5.10 *teamwork characteristics*). I noted that these status differences did not negatively impact upon individual or team performances or learning initiatives (Table 5.10 *teamwork characteristics*). An explanation in this regard may be that collaborative efforts and increased synergy as described by Kraiger and Wenzel (1997: 2) and Smith-Jentsch, Zeisig, Cannon-Bowers and Salas (1997: 201-206) were presented as team performance strategies considered when teams had to address performance difficulties.

From my study I found that team performance was also supported by individual and team performance reflection opportunities, thus allowing for personal and collective explorative events (Table 5.10 *performance reflection*; Table 5.13 *performance reflection* and Figures 5.3 & 5.4). Applied reflection focused on air traffic control skills and relationship events, which prompted self-directed learning opportunities (Table 5.10 *performance reflection*; Table 5.13 *performance reflection* and Figures 5.3 & 5.4). I found that these

individual and team reflective practices corresponded to air traffic control performance characteristics reported by Smith-Jentsch, Zeisig, Cannon-Bowers and Salas (1997: 201-206) and Kraiger and Wenzel (1997: 2).

2.1.2 Relationships inferred from an analysis of self-directed air traffic control team performance results

Cannon-Bowers, Salas and Converse (1993: 221-246) and West, Farmer and Wolff (1991: 27-29) acknowledge that relationships and high levels of shared understanding (shared mental models) between team members ensure efficient and successful goal accomplishment. Intra-team relationships rely upon team members' contributions towards information sharing, helpfulness and fellowship (Smith-Jentsch, Zeisig, Cannon-Bowers and Salas, 1997: 201-206).

In my research I found that helpfulness and fellowship within air traffic control teams were essential in terms of work performance and ensuring reliance amongst team members (Table 5.10 *teamwork dynamics*; Table 5.13 *teamwork dynamics and teamwork characteristics* and Figure 5.6). Team cohesion, situational awareness and collective efficacy resulted from a need to work together within a community of practice that embraced a sense of shared purpose and positive attitudes, thus resulting in team competence (Table 5.10 *teamwork dynamics, teamwork performance measures and teamwork characteristics*; Table 5.13 *teamwork dynamics and teamwork characteristics* and Figures 5.3, 5.4 & 20). Individual and collective goal setting and involvement during difficult controlling periods/tasks strengthened team relations and performances (Table 5.10 *teamwork characteristics and self-efficacy and teamwork activities*).

I found that similar skills levels and shared judgements, problem-solving and decision-making efforts strengthened team relations and emerged as cue-strategy associations, and subsequently enhanced team performance (Figure 5.6). Trust and respect emerged as important individual and collective features of a self-directed team (Table 5.10 *teamwork dynamics* and Figure 5.6).

I discovered that teamwork problems, conflict situations, personal differences and communication shortcomings led to possible performance breakdowns (Table 5.10 *teamwork dynamics*; Table 5.13 *teamwork characteristics* and Figure 5.5). Conflict was addressed by means of team self-correction skills that included supervisor interventions, work schedule changes and conversations/discussions (Tables 5.10 & 5.13 *teamwork characteristics*). During these performance breakdowns teams still strived towards

continuation of air traffic control service delivery (Tables 5.10 & 5.13 *teamwork characteristics* and Figure 5.3).

2.1.3 Reported practices that influenced my understanding of self-directed air traffic control team performance results

Self-directed team performance requires an upholding and safeguarding of air traffic control standards and processes as a shared priority (Smith-Jentsch, Zeisig, Cannon-Bowers & Salas, 1997: 201-206, Fuller, Johnston & McDonald, 1995: 1 and ICAO, 2001: 2.1). In an attempt to understand these air traffic control practices and their impact upon operational performance I uncovered certain teamwork characteristics and activities.

I discovered that a collective orientation towards safety concerns, work processes and duty responsibilities impacted upon team planning initiatives, communication and information exchange, supervision responsibilities and performance activities (Tables 5.10 & 5.13 *teamwork activities and performance reflection* and Figures 5.3 & 5.4). Reports signifying power sharing and a notion that certain team roles were more important than others provided evidence in support of mental models of team role-interaction patterns and boundary spanning of roles and responsibilities (Tables 5.10 & 5.13 *teamwork characteristics* and Figure 5.2). I found that teams illustrated knowledge of performance-related team member characteristics and task expectations (Tables 5.10 & 5.13 *teamwork activities and performance reflection* and Figures 5.3 & 5.4). I believe that this shared knowledge may have been influenced by critical views held by air traffic controllers, sensitivity towards team diversity and pressures exerted by teams towards conformance.

My study of air traffic control performance practices showed acceptance of personal and professional responsibilities, presence of team cohesion/synergy, experience-sharing opportunities and occurrences, and practical/experience-based learning (Tables 5.10 & 5.13 *teamwork activities; performance reflection and teamwork dynamics* and Figures 5.3, 5.4 & 5.6).

From my study I discovered that air traffic control team performance practices corresponded with ATNS (2003: 22) and Barbarino and Isaac's (2000: 271) views of an air traffic control community of practice that approves self-directed team performance.

2.1.4 Summary

In this section I presented my understanding of the impact of self-directed team operations as applicable to this study and considered associated enablers, assessment criteria, inferred relationships and observed practices in this regard. Evidence provided supported an opinion that air traffic controllers valued effective self-directed teamwork that led to desired air traffic control operational outcomes. This summary of self-directed air traffic control team performance impact indicators highlighted these teams' shared professionalism in upholding and safeguarding air traffic control standards and processes in continuous pursuit of aviation safety objectives as well as employment of self-directed learning routines (Tables 5.10 & 5.13 *teamwork activities; performance reflection* Figures 5.3, 5.4 & 5.12).

My understanding of self-directed air traffic control team performance results was consistent with team and team member generic attitudes, cognitive, knowledge and behavioural skills/competencies as described by Smith-Jentsch, Zeisig, Cannon-Bowers and Salas (1997: 201-206) and Cannon-Bowers, Salas and Converse (1993: 221-246).

2.2 Self-directed air traffic control team learning results

Self-directed learning viewed from an adult learning and experiential learning perspective requires collaborative and/or cooperative learning initiatives, experience-based stimuli, reflective practices and an integration of learning and life (Panitz, 1996: 1 & 2, Kolb, 1984: 22, Argyris, 1982: 87 and Hammond & Collins, 1991: 13). Appreciation of self-directed learning phenomena within a defined workplace is challenging as self-directed learning relies upon different forms of individual and collective schemata (Mezirow, 1981: 3-24, Silverman & Casazza, 2000: 21, Zimmerman & Lebeau, 2000: 309 and Rogers, 2002: 9 & 71). The impact of self-directed learning expectations, characteristics, dynamics and influences observed from an individual, collective and organisational perspective is accordingly reported in this section[3].

Self-directed air traffic control team learning should ultimately be aimed at achieving results that support aviation safety and effective team behaviour. Key questions driving an impact study (Readership Institute, 2005: 1) were adapted in order to facilitate this discussion of self-directed team learning results. These

[3] With reference to Chapter 5 Tables 5.9 and 5.12 (Results: Impact of self-directed team learning dynamics within self-managed air traffic control teams) and Figures 5.7 to 5.15 (Self-directed team learning results).

questions are presented below and associated discussions of findings are offered in paragraphs 2.2.1, 2.2.2, 2.2.3 and 2.2.4.[4]

- What aspects were identified that advanced my understanding of self-directed team learning dynamics within self-managed air traffic control teams?
- What relationships were inferred from an analysis of self-directed team learning dynamics within self-managed air traffic control teams?
- How did reported practices influence my understanding of self-directed team learning dynamics within self-managed air traffic control teams?

A statistically significant relationship was found between self-directed team learning and self-directed team performance for teams 1 and 3[5]. In the light of the small samples used, these results were viewed with caution. In the case of team 2 supportive qualitative indicators that supported an absence of a relationship between self-directed team learning and self-directed team performance were not evident. Data presented below (from all three teams) suggested a relationship between self-directed team learning and self-directed team performance.

2.2.1 Aspects identified that advanced my understanding of self-directed team learning dynamics within self-managed air traffic control teams

Self-directed learning focuses on experiences, competencies and challenges (Brockett & Hiemstra, 1991: 104 & 105, Gibbons, 2002: 32 and Zimmerman & Lebeau, 2000: 309). In my study I found that learning and training efforts were directed by air traffic control safety objectives and team performance needs (Table 5.9 *operational training characteristics and learning environment*).

I found that air traffic control teams emphasised an attitude and willingness to learn from experience, appreciate benefits associated with learning from experience and that learning from experience was regarded to be multifaceted (Tables 5.9 & 5.12 *individual learning preferences, participative learning, operational training characteristics and learning environment* and Figures 5.7, 5.8, 5.12 & 5.13). Work environment and social influences reportedly impacted both in a supportive and unsupportive manner upon self-directed team learning (Tables 5.9 & 5.12 *team learning facilitation* and Figure 5.15). Despite these

[4] Subcategories are included as part of references to Tables 5.9 and 5.12 (for example: Table 5.9 *participative learning* – in this regard reference is made to Table 5.9 and specifically the subcategory titled "participative learning").
[5] Reference: Chapter 5 paragraph 3.1.3.

divergent views I found that both individuals and teams agreed that collaborative learning from experience was occurring and that it was advantageous with regard to individual and team development, as well as operational performance (Tables 5.9 & 5.12 *individual learning preferences, participative learning, operational training characteristics and learning environment* and Figures 5.7, 5.8, 5.12 & 5.13).

My research findings of the impact of self-directed team learning could therefore be linked to Boud, Cohen and Walker's (1993: 9-16) five propositions on learning from experience (experience as stimuli for learning, learners construct their experiences, learning is a holistic process, socially and culturally constructed and influenced by the socio-emotional context).

I found that learning-by-doing (experiential learning) presented opportunities to teams and team members to practice skills, reflect upon performances and evaluate service delivery (Tables 5.9 & 5.12 *individual learning preferences and learning environment* and Figures 5.7 & 5.14). Learning took place by means of the competent practice of skills, critical revision of personal practices, creation of new perspectives and direct experiences (Tables 5.9 & 5.12 *individual learning preferences and learning environment* and Figures 5.7 & 5.14). I discovered that these self-directed team learning activities (within the scope of workplace performance) were consistent with Mulligan (1993: 56) and Heron's (Postle, 1993: 33-35) multimodal learning view.

In my research I found that individual and collective learning within air traffic control teams was characterised by planned and unplanned training and learning strategies. I found that training objectives were determined by specific team members (Figure 5.9). A reported reliance on external aided learning (Table 5.9 *individual learning orientation*) by air traffic control teams served as an example of planned training and learning. Acceptance and support for a centralised planned training and cooperative learning approach within the workplace was reported by the teams. This responsibility was generally entrusted to specific members and the teams relied upon their efforts (Table 5.12 *training design* and Figure 5.9). From my study I concluded that planned training and cooperative learning was aligned to a need to provide access to shared meaning structures facilitated by a requirement to interpret and present information by means of individual and collective guided dialogue. In my study I found that learning efforts demonstrated and supported a stance that effective self-directed team learning was dependent upon meta-cognitive competencies that included conscious and deliberate learning strategies as described by West, Farmer and Wolff (1991: 81), Zimmerman and Lebeau (2000: 309) and Zimmerman (1990: 4). My self-directed learning findings were consistent with Dixon's (1994: 43) view of shared meaning structures (which include accessible meaning structures, collective meaning structures and private meaning structures).

I discovered that informal learning activities within the air traffic control workplace served as an example of unplanned/unintentional training and learning occurrences (Tables 5.9 & 5.12 *participative learning*). Unplanned individual and team training and learning initiatives were stimulated by premeditated and ingenuous contributions from team members and personal motives (Tables 5.9 & 5.12 *individual learning preferences and participative learning* and Figures 5.7 & 5.8). These unplanned learning opportunities correspond with a view held by Brookfield (1985: 9) that successful self-directed learning is placed within a social context and relies upon actions and experiences of other team members in order to reinforce learning.

Self-directed team learning reports illustrated a favourable attitude towards purposeful participative/collaborative learning approaches brought about by personal and collective learning needs and opportunities (Tables 5.9 & 5.12 *participative learning* and Figure 5.8). Critical investigations, informal discussions, formal discussions and assuming personal responsibility/resourcefulness were put forward as participative learning initiatives employed within air traffic control teams (Tables 5.9 & 5.12 *participative learning* and Figure 5.8). These self-directed learning initiatives are consistent with Ober, Yanowitz and Kantor (1996: 50), Goleman (1998: 28) and MacLeod's (2001: 26) view that self-directed learning is dynamic and shaped by different individual perspectives.

2.2.2 Relationships inferred from an analysis of self-directed team learning dynamics within self-managed air traffic control teams

Reports from the teams illustrated a shared realisation of the importance of workplace learning and shared support and motivation to learn (Tables 5.9 & 5.12 *team learning facilitation* and Figure 5.15). Value associated with this finding was summarised by a team member who stated: *"learning improves teamwork and teamwork improves the service"* (Table 5.9 *team learning facilitation*). From a learning-relationship perspective I noted that team members acknowledged the existence and value of experts and role models within their air traffic control teams (Table 5.9 *team learning facilitation* and Figure 5.15). A mutual readiness and eagerness amongst team members to share and collect experienced based information was reported (Tables 5.9 & 5.12 *team learning facilitation* and Figures 5.7 & 5.8). These shared learning relationships described were synonymous with a self-directed leading learning approach (where individuals and teams are able to design and implement learning) described by Argyris' (1993(a): 5 & 6).

Air traffic controllers interviewed identified co-learning preferences that included observation of other controllers at work, questioning controllers and obtaining feedback from clients (Tables 5.9 & 5.12 *individual learning preferences* and Figure 5.7). Co-learning preferences mentioned in my study corresponded with Barnes, Ernst and Hyde (1999: 26-28) and Zimmerman and Lebeau's (2000: 309) observation that concerted efforts need to be employed by team members to permit the team's overall learning. Concerted efforts identified comprised individual and collective formal/intentional and informal/unintentional training and learning goals (Tables 5.9 & 5.12 *individual learning preferences and participative learning* and Figures 5.7 & 5.8). Individual and team learning goals were consistent with Dixon's (1994: 36-43) view that organisational meaning is probable when private, collective and accessible meaning structures are integrated.

I found that relationships between personal learning preferences and planned learning preferences had transpired as a result of individual learning agendas and team-based learning agendas (Tables 5.9 & 5.12 *individual learning preferences and participative learning* and Figures 5.7 & 5.8). The role, importance and impact of reflection employed to sustain meaning structures was stressed by team members (Tables 5.9 & 5.12 *individual learning preferences and participative learning*). Findings from my study with regard to the relationships between reflection and learning were consistent with views held by Rogers (2002: 108), Taylor, Marienau and Fiddler (2000: 318 & 322), Hammond and Collins (1991: 14) and Edwards, Hanson and Raggatt (1995: 33-40) that reflection deepens awareness and enhances understanding of behaviour, capabilities, beliefs, purpose, values and environment.

According to Sharry (2001: 2) and Dixon (1994: 120) effective relationships within teams rely upon dialogue that directs experiences, transfers information and challenges established opinions. In my study I found that the use of various communication strategies to enhance learning transmission relevant to individual and collective meta-cognitive competencies was encouraged and apparent in the three teams (Figure 5.12). Communication strategies employed within these self-directed teams encouraged effective teamwork and facilitated formal and informal learning initiatives (Table 5.9 *operational training characteristics*). These benefits associated with effective communication strategies were consistent with Kraiger and Wenzel's (1997: 2) shared mental model characteristics, which included shared task information, mutual expectations and complementary task behaviour.

Status differences within these air traffic control teams were considered by some team members as being a hindrance for effective teamwork (Table 5.9 *teamwork characteristics and operational training characteristics*). However, formal training design, implementation and evaluation responsibilities entrusted

to specific status figures was accepted by team members (Table 5.9 *training design, training implementation and training evaluation* and Figures 5.9, 5.10 & 5.11). I found that entrustment of training formal/intentional training design, training implementation and training evaluation resided with chief air traffic control officers, senior air traffic control officers and appointed training officers (Figures 5.9, 5.10 & 5.11). Teams reported that involvement in these imperatives by team members occurred rarely (Figures 5.9, 5.10 & 5.11). These findings are not congruent with team-centred learning design, implementation and evaluation practices associated with self-directed team learning as offered by Gibbons (2002: 11-13 & 69) and Argyris (1993(a): 1-3). However, I found that informal learning was designed, implemented and evaluated primarily by team members (Tables 5.9 & 5.12 *participative learning*). Use of discussions, experiences and observations suggested that individuals and teams designed, implemented and evaluated learning (Tables 5.9 & 5.12 *participative learning*). These informal/unintentional learning processes were congruent with self-directed team learning preferences (thus pointing out that responsibility for own learning resided mainly with team members) described by Gibbons (2002: 11-13), Dolmans and Schmidt, (2000: 252) and Spear and Mocker (1984: 1-10).

I found that self-directed learning was encouraged by a common aviation safety goal and a necessity work together as an effective team (Table 5.9 *operational training characteristics*). Training, however, rarely included stress coping strategies and human factors aspects (such as personal relations, team cohesion and fostering of mutual trust) (Table 5.9 *operational training characteristics*). It was reported that work-related discussions rarely took place at social gatherings (Figure 5.14). However, perceived value of social interaction as a learning source was acknowledged (Table 5.9 *learning environment*). According to team members opportunities to be sensitised in terms of personality difference influences (Figure 5.15) and to get to know team members at a personal level (Figure 5.12) also occurred rarely. Reasons for exclusion of these themes may be found in reports that not enough planned team-build training opportunities were available and that formal workplace learning was externally directed (Table 5.9 *operational training characteristics*). From my findings I concluded that team resource management and human factors training did not receive consistent attention. Team-build opportunities are considered to be beneficial for human factors training (including team resource management strategies) and self-directed team learning because it addresses individual mental factors, interpersonal factors and associated competencies (Thomas, 2004: 213, Amundson, 1995: 83-86, Isaac & Ruitenberg, 1999: 15 and Hamman, Seamster & Edens, 1995: 89-92).

2.2.3 Reported practices that influenced my understanding of self-directed team learning dynamics within self-managed air traffic control teams

In my study I found that an understanding of self-directed team learning dynamics by teams was influenced by individual learning and participative learning practices. Reported learning in this regard was aimed at meeting aviation safety requirements (Table 5.9 *operational training characteristics*) and directed by team member curiosity (Figure 5.7). I found that individual and participative learning was inspired by problem-based learning, experiential learning and reflective learning preferences (Figure 5.7). This finding corresponds with Dixon (1994: 39) and McCann's (2005: 2) assertion that action learning is fundamental to self-directed team performance. Morning meetings, on-the-job training periods, formal briefings, informal discussions, observations, critical reflections, posing of questions and lessons learned from other's mistakes were used by the teams to enhance learning transmission relevant to individual and collective meta-cognitive competencies (Tables 5.9 & 5.12 *individual learning preferences and participative learning* and Figures 5.7 & 5.8). My findings regarding individual and participative learning benefits were consistent with those of Barnes, Ernst and Hyde's (1991: 1) acknowledgement that self-directed teamwork helps team members to enhance their own performance by making use of observations and experiences.

I found that an attitude and willingness to assume responsibility for learning (mainly informal learning) encouraged team members to learn from workplace experiences and to stimulate learning by expressing concerns, suggestions and requests (Table 5.9 *operational training characteristics* and Figures 5.12 & 5.13). In this regard Rogers (2002: 107) states that learning is accomplished by critically analysing experiences and acting on the basis of that analysis. Formal/intentional training presented included lectures, presentations, briefings and structured discussions (Tables 5.9 & 5.12 *learning environment* and Figure 5.14). Informal workplace experiential training as well as design, implementation and evaluation of formal training were encouraged by air traffic control operational management (Figures 5.9, 5.10 & 5.11). These findings relating to learning responsibilities coincide with Brockett and Hiemstra's (1991: 10-17) outlook that self-directed learners accept responsibility and control over planning, implementation and evaluation of individual and collective learning experiences.

Blumberg (2000: 199) reports that team members, participating in problem-based learning, demonstrate self-directed learning skills. I found that individual learning experiences (often motivated by scenario-building, incidents, mistakes and emergencies) were shared within teams resulting in reports from team members of enhanced team performance (Table 5.9 *participative learning and operational training characteristics*).

2.2.4 Summary

This section presented my understanding of the impact self-directed team learning as applicable to this study and considered associated enablers, assessment criteria, inferred relationships and observed practices in this regard. I discovered that participants in my study employed self-directed learning in order to ensure aviation safety imperatives. Self-directed learning was apparent at individual level and relied mainly upon informal/unintentional learning. Self-directed team learning stemmed from all individual self-directed learning undertakings integrated by means of formal/intentional and informal/unintentional learning approaches. However, informal/unintentional approaches seemed to be a preferred primary mode of collaborative learning and were considered to be more beneficial. I found that self-directed air traffic control team learning impact indicators were apparent in air traffic control management's commitment with regard to training, team member's dedication towards self-regulated learning and teams' devotion concerning shared training and learning ownership (Tables 5.9 & 5.12 *participative learning and operational training characteristics* and Figures 5.8, 5.12 & 5.15).

I discovered that team members generated valid and useful information to solve problems (Tables 5.9 & 5.12 *participative learning and operational training characteristics* and Figures 5.8, 5.12 & 5.15). My understanding of the impact of self-directed air traffic control team learning that included sharing of valid information and vigilant monitoring of own and other's experiences in order to detect and correct error was aligned to Model 2 theory-in-use (Argyris, 1982: 101-103). Accordingly I identified self-regulated learning traits which corresponded with Zimmerman's (1990: 4) view that team members become metacognitively, motivationally and behaviourally active participants in self-directed learning. From my study I concluded that self-directed learning occurred in terms of Bruffee (1993: 3) and Argyris' (1992: 68) notion of double-loop learning. This conclusion is motivated in terms of reports where team members observed and reflected upon each other's actions, which in turn guided individual and/or collective actions (Tables 5.9 & 5.12 *participative learning and operational training characteristics* and Figures 5.8, 5.12 & 5.15).

2.3 Future/continued air traffic control team learning possibilities

Sustained competence of air traffic controllers contributes to self-directed team performance. According to IFATCA (2001(a): 1) air traffic controllers should participate in continuation training in order to ensure maintenance of desired performance standards. An important undertaking of continuation training is human factors training (including team resource management), which is required to cope with present and future

aviation safety workplace challenges (Fuller, Johnston & McDonald, 1995: 1 and CAST, 1999: 23). Creating understanding in this regard required an investigation of the nature of air traffic control teams' continuation training practices and the result of continuation training on service delivery. The impact of continuation training (also referred to as continued or future training) observed from an individual, collective and organisational perspective, is accordingly reported in this section[6].

Continuation training within a rapidly changing air traffic control environment should ultimately be aimed at achieving results that support aviation safety and self-directed teamwork (Smith-Jentsch, Kraiger, Salas & Cannon-Bowers, 1999: 42-49). Key questions driving an impact study (Readership Institute, 2005: 1) were adapted in order to facilitate this discussion of air traffic control continuation training. These questions are presented below and associated discussions of findings are offered in paragraphs 2.3.1, 2.3.2, 2.3.3 and 2.3.4.[7]

- What aspects were identified that advanced my understanding of future/continued air traffic control team learning possibilities within self-managed air traffic control teams?
- What relationships were inferred from an analysis of future/continued air traffic control team learning possibilities within self-managed air traffic control teams?
- How did reported practices influence my understanding of future/continued air traffic control team learning possibilities within self-managed air traffic control teams?

2.3.1 Aspects identified that advanced my understanding of future/continued air traffic control team learning possibilities

I found that continued learning was encouraged by air traffic control management (Figure 5.14). Continued learning was encouraged and managed mainly by means of formal cooperative continuation training events (Tables 5.11 & 5.14 *continued learning strategies* and Figure 5.14). Formal continuation training efforts frequently addressed task-related learning contents (Table 5.11 *continued learning strategies*). My findings in this regard included information exchange matters, team feedback skills and flexibility abilities as described by Meyer (1999: 90), Smith-Jentsch, Kraiger, Salas and Cannon-Bowers (1999: 1-3) and Salas, Bowers and Edens (2001: 36-42 & 243). Human factors elements such as stress coping and team resource

[6] With reference to Chapter 5 Tables 5.11 and 5.14 (Results: Impact of self-directed team learning in the air traffic control workplace continuation training scenario), Figure 5.13 (Continuation training characteristics) and Figure 5.14 (Workplace learning environment characteristics).
[7] Subcategories are included as part of references to Tables 5.11 and 5.14 (for example: Table 5.11 *continued learning strategies* – in this regard reference is made to Table 5.11 and specifically the subcategory titled "continued learning strategies").

management strategies were rarely addressed by air traffic control teams as part of continuation training (Figure 5.13). Learning content addressing team member competencies, team member attitudes, supporting behaviours and team situation awareness as described by Smith-Jentsch, Kraiger, Salas and Cannon-Bowers (1999: 1-3), Owen (2000: 333) and Salas, Bowers and Edens (2001: 36-42 & 243) were thus rarely covered during continuation training proceedings. This finding may also be related to reports that not enough planned team-build training opportunities were available (Table 5.9 *operational training characteristics*).

Mixed feelings were expressed by teams and team members in terms of the impact of continuation training benefits (Table 5.11 *continued learning strategies and continued learning value* and Table 5.14 *continued learning environment and continued learning value*). Reports from the three teams revealed that continuation training was centrally managed, time-bound and possibly not always well received by team members (Table 5.11 *continued learning strategies and continued learning expectations* and Table 5.14 *continued learning strategies, continued learning environment, continued learning expectations and continued learning value*). My findings were not congruent with effective continuation training requirements stated by Williams (2004: 1-5), Yancey (2005: 1) and Smith-Jentsch, Kraiger, Salas and Cannon-Bowers (1999: 1-3), which require that a sociable and favourable learning environment needs to exist that encourages concerted efforts by all team members.

2.3.2 Relationships inferred from an analysis of future/continued air traffic control team learning possibilities

No statistically significant differences existed between the three teams in terms of continuation training[8]. Air traffic management endeavoured to create an environment that supported workplace learning and continued learning (Figures 5.9, 5.10, 5.11 & 5.14). A potential relationship between formal self-directed team learning and formal air traffic control workplace continuation training was perceived (Table 5.11 *continued learning strategies* and Figures 5.13 & 5.14). This perceived relationship focused mainly on task specific content in pursuit of a common aviation safety goal.

[8] Reference: Chapter 5 paragraph 3.1.4.

2.3.3 Reported practices that influenced my understanding of future/continued air traffic control team learning possibilities

According to Smith-Jentsch, Kraiger, Salas and Cannon-Bowers (1999: 1-3), ATNS (2003: 22-24) and Salas, Bowers and Edens (2001: 36-42 & 243) air traffic control continuation training should incorporate individual and team knowledge, attitudes and skills. Continuation training practices need to include knowledge, attitude and skill contents made up of air traffic control task contents and human factors contents (Gibbons, 2002: 7, Smith-Jentsch, Kraiger, Salas and Cannon-Bowers, 1999: 1-3 and Salas, Bowers & Edens, 2001: 36-42 & 243). Continuation training practices identified in my study comprised a formal approach that incorporated planned lectures presentations, case studies, quizzes, exams, and directed discussions that focused primarily on air traffic control task contents (Table 5.11 *continued learning strategies* and Figures 5.13 & 5.14). According to Smith-Jentsch, Kraiger, Salas and Cannon-Bowers (1999: 42-45) successful continuation training is characterised by continuation training awareness, interactive learning and feedback, and reinforcement activities. My findings with regard to continuation training practices reported by the three teams were not consistent with Smith-Jentsch, Kraiger, Salas and Cannon-Bowers (1999: 42-45) requirements for successful continuation training efforts.

2.3.4 Summary

Continued learning expectations, characteristics, environments, strategies and value were addressed in this section. Findings presented supported an opinion that formal/intentional continuation training practices were used by air traffic control teams to address task-specific knowledge, skills and attitudes in a similar and cooperative manner. Impact indicators related to these formal air traffic control continuation training activities were traced in terms of contributions to continued aided learning and situational awareness in support of air traffic control knowledge, skills and attitudes (Table 5.11 *continued learning strategies and continued learning value*; Table 5.14 *continued learning value* and Figure 5.13).

These air traffic control continuation training results were found to be not fully aligned to the views of Smith-Jentsch, Kraiger, Salas and Cannon-Bowers (1999: 1-3) and Salas, Bowers and Edens (2001: 36-42 & 243) due to a perceived partial exclusion of human factors content from continuation training. It was also found that continuation training was managed generally in a formal/intentional manner, while informal continuation training practices and associated impact were less obvious (Table 5.11 *continued learning strategies and continued learning value*; Table 5.14 *continued learning value* and Figures 5.13 & 5.14).

3 Contextualising results

In this section findings presented in paragraphs 2.1, 2.2 and 2.3 were contextualised in order to present an integrated view and understanding of the impact of self-directed team learning in an air traffic control environment. My finding regarding the existence of a statistically significant relationship between self-directed team performance and learning and learning approaches is used as a point of departure in this discussion[9]. A broad-spectrum association from a statistical perspective was not claimed with reference to relationships between learning approaches (considering learning content and social orientations when learning) and self-directed team results (considering self-directed team performance and self-directed team learning). Statistical significant correlations between certain learning approaches (considering learning content and social orientations when learning) and certain self-directed team results (considering self-directed team performance and self-directed team learning) were, however, valuable and supportive of contextualised results presented below.

In an attempt to facilitate a deeper understanding regarding team performances and team learning I cross-checked insights with respect to team's performances and self-directed team learning relationships. Self-directed team learning within an air traffic control environment served as a central theme in this regard. Intra- and inter-team perspectives and team member's perspectives were utilised in creating understanding of the impact of self-directed team learning in an air traffic control environment. Understanding and appreciating individual and team learning, team performance and continued learning similarities and/or differences required a process of multilayered pattern-seeking by integrating individual, team and the air traffic control organisation experiences[10]. Results of this process of inductive data analysis and summary are presented below.

Air traffic controllers (considering individual, team and organisational perspectives) directed efforts towards achieving well defined, known and accepted aviation safety objectives. Achievement of these shared objectives relied primarily on task-specific team and team member generic attitudes, cognitive, knowledge and behavioural competencies. Self-directed teamwork and associated self-directed team learning inspired professional competence required to achieve air traffic control operational outcomes. In addition

[9] Reference: Chapter 5 paragraph 3.2.
[10] A crystallisation style permitted maximum experiences within the analytical style (McMillan and Schumacher, 2001: 463).

relationships found between teams' learning approaches and self-directed team performances were supportive of self-directed team learning[11].

Self-directed learning emerged as individual and integrated formal and informal learning events and experiences. Informal learning, described as a preferred mode of learning, allowed team members to observe and reflect upon own actions and other's actions, thus allowing them to become actively involved in self-directed learning. Informal learning at individual level facilitated both task-specific and human factors learning. Formal learning illustrated a reliance on planned collective learning events. Continued/future learning was formalised in terms of continuation training. Formal self-directed and continuation training initiatives focussed mainly on task competencies, whereas human factor competencies did not receive as much consideration. Training and learning initiatives identified in the air traffic control organisation supported self-directed learning theories and practices. Self-directed learning was described by participants in my study as a means to ensure compliance with individual and team competence/ performance requirements. Workplace performances in turn served as a self-directed learning input.

Statistically significant relationships between air traffic control self-directed team learning and operational performance outputs may have been evident in teams 1 and 3. However, such a relationship should be understood in terms of the potential success/impact thereof on aviation safety. These success/impact indicators may be revealed in organisational commitment and support for self-managed and empowered training and learning within air traffic control teams. Contextual results offered collective insight into three self-managed teams' self-directed learning approaches and contributions to aviation safety within an air traffic control community of practice.

4 Synthesis

Synthesis 

Discussion of findings and contextualising of results presented in this chapter suggest that self-directed team learning offered opportunities for individuals and teams within an organisation to influence air traffic control team performances in an air traffic control work environment. **This statement proposes a perceived relationship between self-directed team learning and air traffic control operational outputs.**

[11] Reference: Chapter 5 paragraph 3.2.

The nature of self-directed team learning's impact on the air traffic control work environment was illustrated by presenting identified and described individual and collective (team) views and dynamics. Impact of air traffic control team performances was traced in terms of identified teamwork characteristics, activities, dynamics, performance measures and focus areas and reflective practices.

A deeper understanding of modes of learning by self-directed teams and the impact of self-directed learning upon work performance was discovered from individual and participative learning perspectives. My research included descriptions of the impact of operational training practices with regard to training design, implementation, facilitation and evaluation.

A further understanding and appreciation of how these air traffic control teams sustained continued learning in the workplace was also probed. This inquiry uncovered continued learning expectations, environments, strategies, and benefits.

While considering this discussion of findings and contextualising of results I was able to conclude that self-directed learning within air traffic control teams had an impact on air traffic control operational outcomes, thus contributing towards a critical air traffic control goal – aviation safety[12].

[12] The aim of this research was to discover multiple realities that were assumed to be present in the air traffic control self-directed team learning environment. Accordingly research constraints listed in Chapter 4, paragraph 2 were respected. My discussion of research findings and contextualising of results is only relevant to my study. Generalisations were not a research objective and were not intended.

CHAPTER 7

CONCLUSIONS AND RECOMMENDATIONS

		Page
1	**Introduction**	351
2	**Overview of this study**	351
3	**Limitations of this study**	353
4	**Ethical aspects**	354
5	**Summary of findings**	355
6	**Answering the research questions**	356
7	**Possible contributions**	356
8	**Recommendations**	357
8.1	Recommendations for practice	357
8.2	Recommendations for training	357
8.3	Recommendations for research	358
9	**Concluding comments**	358

Figure 7.1 Chapter 7 orientation

Introduction	
Overview of this study	
Limitations of this study	
Ethical aspects	
Summary of findings	
Answering the research questions	
Possible contributions	
Recommendations	Recommendations for practice
	Recommendations for training
	Recommendations for research
Concluding comments	

Compiled by the researcher

1 Introduction

Introduction

In Chapter 6 the results of this study were presented according to the following secondary research questions, as formulated in Chapter 1:

- Do air traffic controllers perceive a relationship between self-directed team learning and the air traffic control operational output?
- What is the nature of perceived relationships between self-directed team learning and the air traffic control operational output?
- What are the self-directed team learning dynamics within self-managed air traffic control work teams?
- Do air traffic controllers perceive a relationship between self-directed team learning and air traffic control workplace continuation training?
- What is the nature of perceived relationships between self-directed team learning in the air traffic control workplace continuation training scenario?

Responses to these questions helped to answer the following primary research questions:

- **Does self-directed team learning impact on the air traffic control work environment?**
- **What is the nature of self-directed team learning impact on the air traffic control work environment?**

This chapter offers a final synopsis to this study by providing an overview of the study and a summary of conclusions and recommendations.

2 Overview of this study

Overview of this study

This impact study provided a picture of perceived current reality as presented by 25 respondents. Essential focus areas of this impact study including aspects of relevance are presented below.

- Aspects identified that advanced understanding of self-directed team performance results.
- Relationships inferred between aspects/elements that resulted from an analysis of self-directed team performance results.
- Practices that influenced my understanding of self-directed team performance results.
- Aspects identified that advanced my understanding of self-directed team learning dynamics within self-managed air traffic control teams.
- Relationships inferred from an analysis of self-directed team learning dynamics within self-managed air traffic control teams.
- Practices that influenced my understanding of self-directed team learning dynamics within self-managed air traffic control teams.
- Aspects identified that advanced my understanding of future/continued air traffic control team learning possibilities within self-managed air traffic control teams.
- Relationships inferred from an analysis of future/continued air traffic control team learning possibilities within self-managed air traffic control teams.
- Practices that influenced my understanding of future/continued air traffic control team learning possibilities within self-managed air traffic control teams.

An outline and summary of each of the chapters is provided below.

Chapter 1. In this chapter an overview of the study was provided. This chapter offered an introduction to the study and the rationale for this research. The research problem was described in terms of the impact that self-directed team learning in an air traffic control environment may have. Relevant concepts and terminology were explained in order to serve as an introduction to the specific "world of air traffic control". A brief orientation and discussion was provided in the form of an outline of the research strategy and process.

Chapter 2. In Chapter 2 a theoretical framework was presented as a platform for this study. Literature relevant to this research problem was offered to provide understanding regarding adult learning, learning within teams, self-directed learning, air traffic control operations, air traffic control training and human factors.

Chapter 3. Chapter 3 offered a conceptual orientation that was deemed appropriate. A philosophical departure point and learning conceptualisation were presented in support of the research paradigms of inquiry.

Chapter 4. Chapter 4 offered an in-depth research design and methodology discussion and explanation. This study followed a mixed methods approach (QUALITATIVE - quantitative). Data collection techniques incorporated individual interviews, focus group interviews, self-directed team learning questionnaires (SDTLQ) and learning approach questionnaires (LAQ). An explanation of data analysis and data validation strategies followed after a discussion of my role as researcher.

Chapter 5. In Chapter 5 results obtained were analysed. This analysis focus was placed on both qualitative results and quantitative results.

Chapter 6. In Chapter 6 results obtained from the two phases of this study were presented. A discussion of findings and contextualising of results of this study with information from the literature review ensued. Triangulation was central in this process and ensured a synthesis of findings.

Chapter 7. This chapter presents a final overview of this study with reference to the entire research process. Essentially this chapter therefore focuses on conclusions drawn from this study, as well as recommendations for practice and further research.

3 Limitations of this study

Limitations of this study ←

The following listed limitations to this study (from a qualitative perspective) existed and are acknowledged.

- Research was restricted to three air traffic control centres.
- Only one person performed data collection and interpretation.
- The Hawthorne[1] effect could influence team dynamics, environmental influences and learning dynamics.
- Findings could be criticised in terms of the Hawthorne effect and personal bias.
- Continuous changes in the teams being investigated occurred due to shift and staff rostering requirements.
- This study had a narrow focus, being self-directed team learning.

[1] Hawthorne effect: the tendency of people to act differently because they realise that they are subjects in a study (McMillan & Schumacher, 2001: 591).

- Several respondents had worked and/or trained with the researcher in the past. The researcher role of the researcher may have been strange to individuals and/or teams and thus influenced behaviour.

The following listed limitations to this study (from a quantitative perspective) existed and are acknowledged.

- Respondents may have perceived the researcher's non-participative approach as "cold and distant", which may have influenced responses.
- The Hawthorne effect may have influenced feedback from respondents.
- Respondents may have been oversensitive to certain aspects of the research environment and may have directed their responses accordingly.
- All air traffic controllers did not have an equal chance of being included in the sample because a non-probability convenient sample was used. The sample consisted of 25 respondents. This sample size did not meet the minimum number of 26 respondents[2].

I acknowledge that different data collection instruments and different research paradigms could be used to enhance understanding of this topic. I also acknowledge that different researchers may or may not arrive at different findings by means of a re-analysis of collected data.

4 Ethical aspects[3]

Ethical aspects 

In accordance with ethical requirements I acknowledge the following:

- I obtained written permission from the South African Air Force to conduct the research on 18 February 2005 (Appendix K).
- I informed all respondents during meetings at each air traffic control centre regarding the aim, objectives, nature and ethical requirements of this research project. Participation was voluntary and informed consent from participants was obtained. Confidence was ensured by not disclosing the identity of respondents and research sites.

[2] According to Stoker (1981: 13) a sample size of 26 was considered to be adequate for this study.
[3] The ethical clearance certificate provided by the Faculty of Education at the University of Pretoria is attached as Appendix I.

- I ensured that participants were not exposed to any undue physical or psychological harm.
- Raw data obtained will be available for at least one year after completion of this project and coded data were stored on CD.

5 Summary of findings

Summary of findings ←

Based on my findings discussed in this study an understanding regarding the impact of self-directed team learning in an air traffic control environment emerged.

The impact of self-directed team learning from explanations, discussions, occurrences and initiatives presented by respondents was evaluated at individual, team/collective and organisational levels. My summarised findings are presented below.

- Self-directed teamwork and associated self-directed team learning inspired professional competence required to achieve air traffic control operational outcomes.
- Relationships found between teams' learning approaches and self-directed team performances were supportive of self-directed team learning.
- Self-directed learning emerged as individual and integrated formal and informal learning events and experiences.
- Continued/future learning was formalised in terms of continuation training.
- Training and learning initiatives identified in the air traffic control organisation supported self-directed learning theories and practices.

My discussions of research findings and contextualising of results are only relevant to my study. Generalisations were not a research objective and were not intended. Considering these conditions I concluded that the quality of team performance was influenced by self-directed team learning initiatives. Furthermore it transpired that the quality of self-directed team learning also relied upon the effectiveness of air traffic control team performances.

6 Answering the research questions

Answering the research questions ←

In response to the two primary research questions I concluded that:

- self-directed team learning impacted constructively on the air traffic control work environment; and
- the nature of self-directed team learning impact on the air traffic control work environment could be traced in terms of contributions towards aviation safety, individual and participative learning practices and operational training practices with regard to training design, implementation, facilitation and evaluation.

In response to the secondary research questions I concluded that air traffic controllers perceived:

- a relationship between self-directed team learning and the air traffic control operational output, mainly in terms of aviation safety[4];
- that self-directed team learning dynamics within self-managed air traffic control work teams consisted of individual and integrated formal and informal learning events and experiences; and
- a relationship between self-directed team learning and air traffic control workplace continuation training, albeit mainly a formal/intentional training approach[5].

7 Possible contributions

Possible contributions ←

I am of the opinion that this study should make a positive contribution to understanding the impact of self-directed team learning within an air traffic control environment.

On the whole this study's perceived significance may be found in its contribution towards aviation safety. Findings of this study may encourage awareness from air traffic control service providers to stimulate, implement, manage and evaluate self-directed team learning within teams. Such self-directed team learning

[4] A statistically significant relationship (at the 5% level of significance) for teams 1 and 3 was found in this respect.
[5] No statistically significant differences (at the 5% level of significance) existed between the three teams in terms of continuation training.

may also contribute towards improved teamwork and team performances. Again, a need may be identified to monitor and evaluate teamwork and team performances as a result of self-directed team learning investments.

A self-directed team learning approach may thus contribute to aviation safety within the air traffic control community of practice.

8 Recommendations

Recommendations	Recommendations for practice
	Recommendations for training
	Recommendations for research

Recommendations with regard to practice, training and further research are presented in this section. It must be noted that the intention is not to restrict the implications of this study to these presented recommendations.

8.1 Recommendations for practice

Findings obtained from this study may be used as a basis for helping to understand, prepare and manage air traffic controllers to perform in a collaborative manner within effective air traffic control teams. These different operational training characteristics may be useful, not only for air traffic control teams but for other institutions implementing teamwork activities and team performances. Information and guidance required in this regard may consist of initial and continued training and development strategies that are purposefully designed, developed, implemented and evaluated to encourage effective team performance and ensure overall aviation safety.

8.2 Recommendations for training

In this study self-directed learning was described by participants as an effective means to ensure compliance with individual and team competence/ performance requirements.

Informal learning initiatives may be considered by team members to observe and reflect upon own actions and other's actions thus allowing them to become actively involved in self-directed learning. Informal learning at individual level can facilitate both task-specific and human factors learning.

Formal learning initiatives may also be considered when planning collective learning events. Formal self-directed and continuation training initiatives are used mainly to address task competencies.

8.3 Recommendations for research

Findings of this study suggest that self-directed team learning may be an appropriate training and learning approach for air traffic controllers and air traffic control teams to follow. Therefore a complete and suitable self-directed team learning guide for use by air traffic controllers, air traffic control teams and air traffic control service organisations (possibly as part of human factors training) possibly needs to be designed, developed, implemented and evaluated. Such an initiative could use information obtained in this study to address these training and learning needs, although additional related studies might also need to be consulted.

9 Concluding comments

Concluding comments 

This chapter provided an overview of the results and findings of the study. Quantitative and qualitative data were analysed and interpreted in order to explore and determine whether or not self-directed team learning impacted upon a specific air traffic control environment.

Air traffic controllers are arguably a vital link in support of international aviation safety. This study revealed that air traffic controllers and air traffic control teams do indeed function within self-directed working, training and learning environments. Air traffic controllers who participated in this study, affirmed their need for effective teamwork and continued learning, which in turn, served as essential performance requisites.

In summary, air traffic controllers require the support and guidance from their fellow team members to fulfil their roles adequately. Understanding self-directed air traffic control team performance and the impact of self-directed team learning on such performance should not only benefit air traffic controllers, air traffic control teams and air traffic control organisations, but also the public that makes use of air transport.