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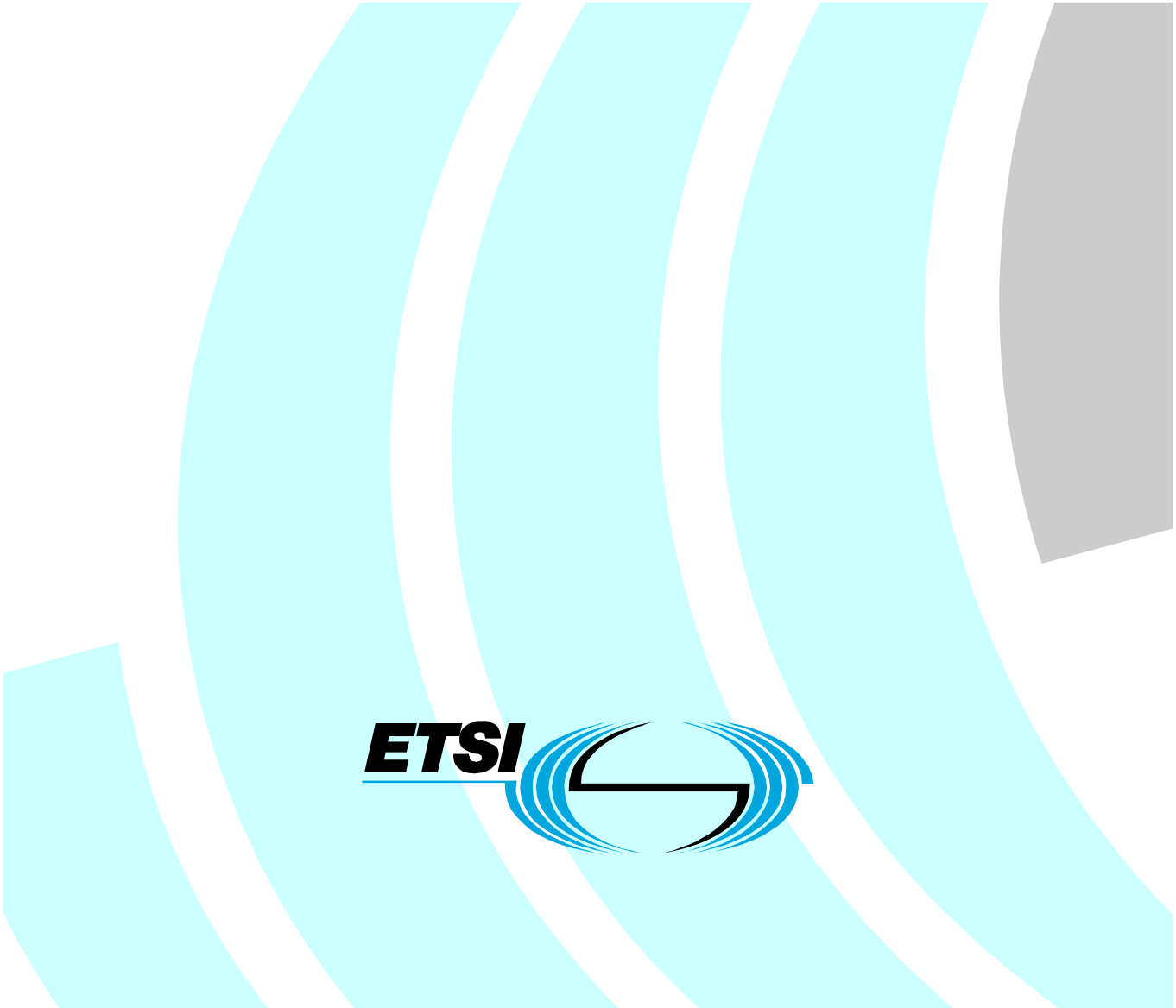
Technical Report

Terrestrial Trunked Radio (TETRA); TWC2007 Future of TETRA workshop report



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Foreword

This Technical Report (TR) has been produced by ETSI Technical Committee Terrestrial Trunked Radio (TETRA).

1 Scope

The present document reports the results of the TETRA World Congress 2007 Future of TETRA workshop.

2 References

References are either specific (identified by date of publication and/or edition number or version number) or non-specific.

- For a specific reference, subsequent revisions do not apply.
- Non-specific reference may be made only to a complete document or a part thereof and only in the following cases:
  - if it is accepted that it will be possible to use all future changes of the referenced document for the purposes of the referring document;
  - for informative references.

Referenced documents which are not found to be publicly available in the expected location might be found at http://docbox.etsi.org/Reference.

For online referenced documents, information sufficient to identify and locate the source shall be provided. Preferably, the primary source of the referenced document should be cited, in order to ensure traceability. Furthermore, the reference should, as far as possible, remain valid for the expected life of the document. The reference shall include the method of access to the referenced document and the full network address, with the same punctuation and use of upper case and lower case letters.

NOTE: While any hyperlinks included in this clause were valid at the time of publication ETSI cannot guarantee their long term validity.

2.1 Normative references

The following referenced documents are indispensable for the application of the present document. For dated references, only the edition cited applies. For non-specific references, the latest edition of the referenced document (including any amendments) applies.

Not applicable.

2.2 Informative references

The following referenced documents are not essential to the use of the present document but they assist the user with regard to a particular subject area**.** For non-specific references, the latest version of the referenced document (including any amendments) applies.

Not applicable.

3 Abbreviations

For the purposes of the present document, the following abbreviations apply:

API	Application Programming Interface
DMO	Direct Mode Operation
GCK	Group Cipher Key
GoS	Grade of Service
HSD	High Speed Data
IMS	IP Multimedia Subsystem
IOP	InterOPerability
IPI	IP Inter-working
LMB	Local Mode Broadband
MS	Mobile Station
MTBF	Mean Time Between Failure
OUA	Operators and Users Association
PMR	Private Mobile Radio
PSRG	Public Safety Radiocommunications Group
RF	Radio Frequency
SDS	Short Data Service
SwMI	Switching and Management Infrastructure
TEDS	TETRA Enhanced Data Service
TC	Technical Committee
TMO	Trunked Mode Operation also known as V+D
URS	User Requirement Specification
V+D	Voice plus Data
WBB	Wireless BroadBand

4 TETRA World Congress 2007 Future of TETRA workshop report

4.1 Background

Since the TETRA World Congress in November 2005, several meetings, seminars and workshops took place at which the future requirements of TETRA were mentioned:

- Various TC TETRA WG and Plenary meetings.
- TETRA Association Members workshop 2006.
- TETRA Association TEDS workshop 2007.
- TETRA Association OUA and PSRG Meetings 2006/07.

Besides new requirements, some areas of performance enhancements were also identified:

- TMO, DMO, TEDS, Packet Data, SDS.

New technology developments in other telecommunication areas also stimulated new user requirements:

- 3G/UMTS;
- WiMAX;
- Multi-Mode/Multi-Technology terminals (UMTS - GPRS - GSM - WLAN - Bluetooth®).

As a result of these numerous meetings, TC TETRA felt it appropriate to facilitate a workshop at the TETRA World Congress 2007 (with the added benefit of important input from outside Europe) to discuss the candidate TETRA enhancement areas.

4.2 Workshop Objectives

The objectives of TC TETRA for the workshop were:

- to provide a clear indication to TC TETRA of the weighting and relative importance of all candidate TETRA enhancement areas identified;
- to produce a set of User Requirement Specifications (URSs) for use in TC TETRA to initiate new standardisation work by the technical Working Groups as required;
- to further enhance the portfolio of TETRA standards with new services and facilities, as well as performance enhancements, to ensure the continued evolution, success and longevity of TETRA as the technology of choice for traditional PMR user organisations.

4.3 Workshop Methodology

The Future of TETRA Workshop was held on Monday 11th June at the TETRA World Congress 2007, facilitated by selected members of Technical Committee (TC) TETRA in traditional workshop style.

The delegates received a welcome pack including:

- Workshop Programme;
- List of Candidate TETRA Enhancement Areas.

To ensure the maximum benefit to participating delegates and the TETRA industry as a whole in the limited time available, a list of candidate TETRA enhancement areas was enclosed for delegates to consider (prior to the workshop) regarding importance and relevance to their organisation's future needs. This list is available at annex C.

This comprehensive list covers requirements identified from a number of workshops and meetings facilitated by the TETRA Association and ETSI TC TETRA since the TETRA World Congress in November 2005.

The delegates were asked to complete questionnaire 1 (see annex A) on arrival.

The TC TETRA Chairman provided as part of the introduction and warm up to the actual workshop session an overview of all the 44 TETRA enhancement areas listed in questionnaire 2 (see annex B):

- TMO Network Enhancements (9).
- DMO Enhancements (14).
- Data Enhancements (6).
- General Enhancement Areas (10).
- Industry Performance Enhancements (5).

The actual workshop sessions were conducted in small groups of maximum nine people. Selected members of TC TETRA were assigned a workshop group to facilitate, record findings, and present findings to all delegates at the end of the session. The facilitators described in more detail the candidate enhancement areas and assisted with completion of questionnaire 2. Each delegate had:

- 100 currency units to spend in each enhancement area groupings to rank and rate importance of the requirements within the grouping;
- 100 currency units to spend across the five groups to assess the relative importance of the groups.

After the workgroup sessions the findings from each session were presented to all delegates.

A question and answers session was used to refine and agree the main findings from the workshop as a whole.

4.4 Delegate breakdown

The workshop resulted in 60 valid responses useful for analysis. A breakdown of the composition of the delegates is provided in the charts in figures 1 to 10.

4.4.1 High level delegate breakdown

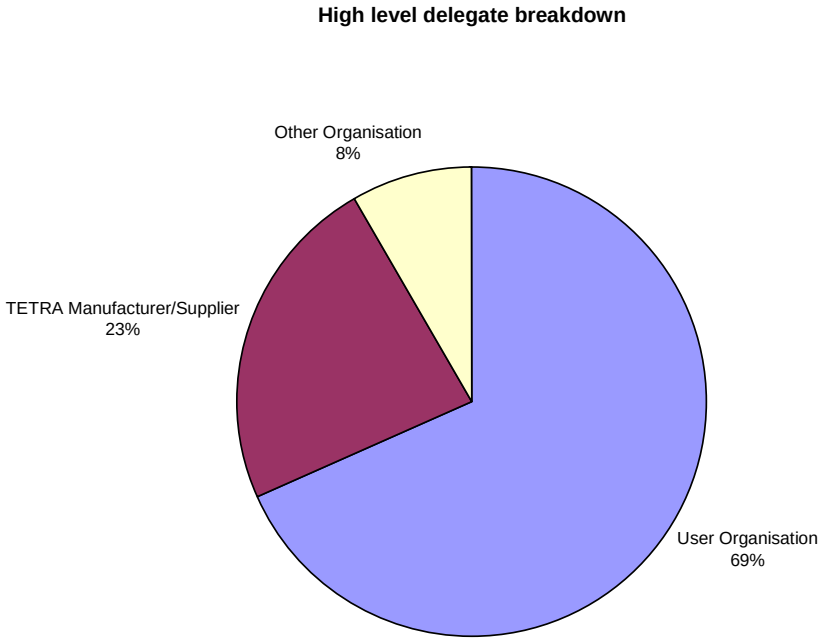

Figure 1

4.4.2 User delegate breakdown

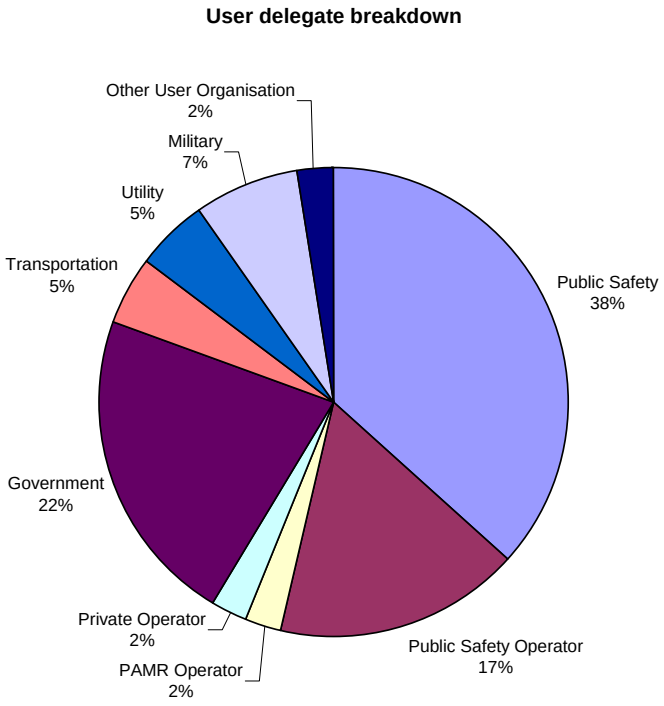

Figure 2

4.4.3 TETRA Manufacturer / Supplier delegate breakdown

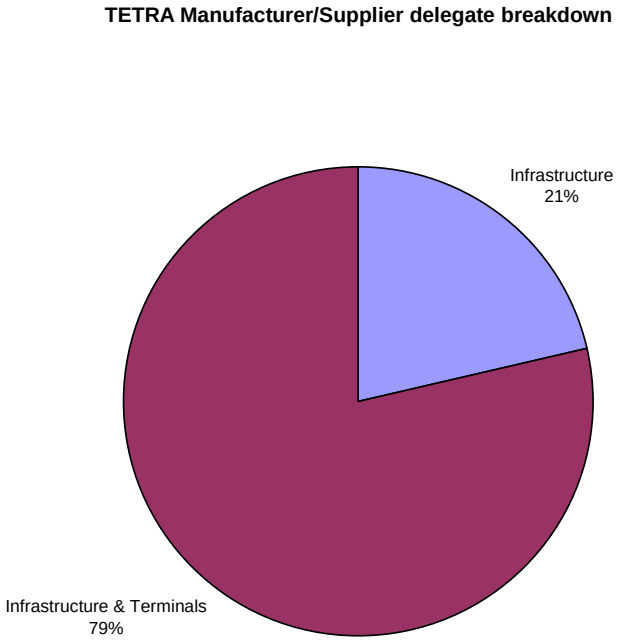

Figure 3

4.4.4 Other delegate breakdown

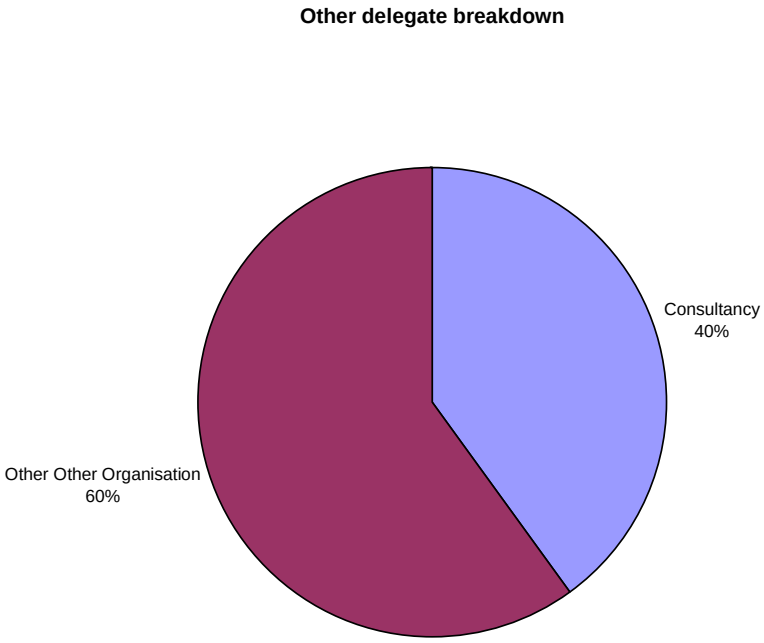

Figure 4

4.4.5 Public Safety and Security User delegate breakdown

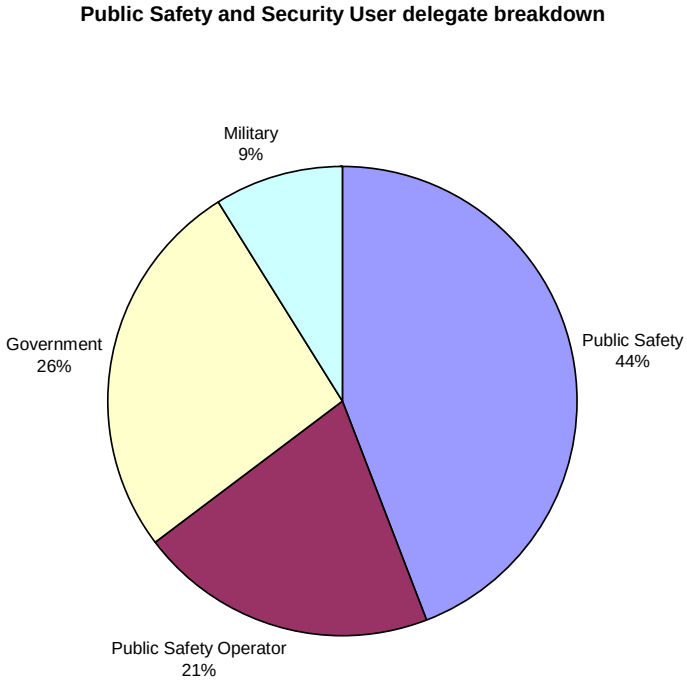

Figure 5

4.4.6 Non Public Safety and Security User delegate breakdown

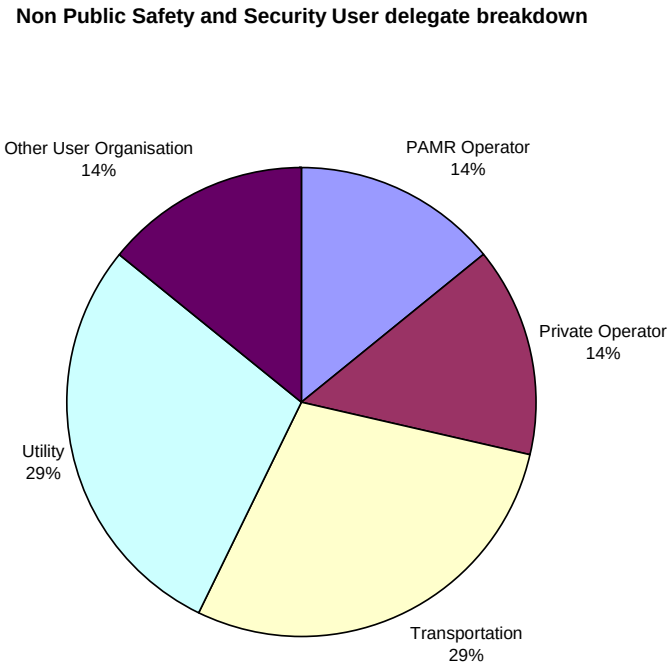

Figure 6

4.4.7 Delegate experience breakdown

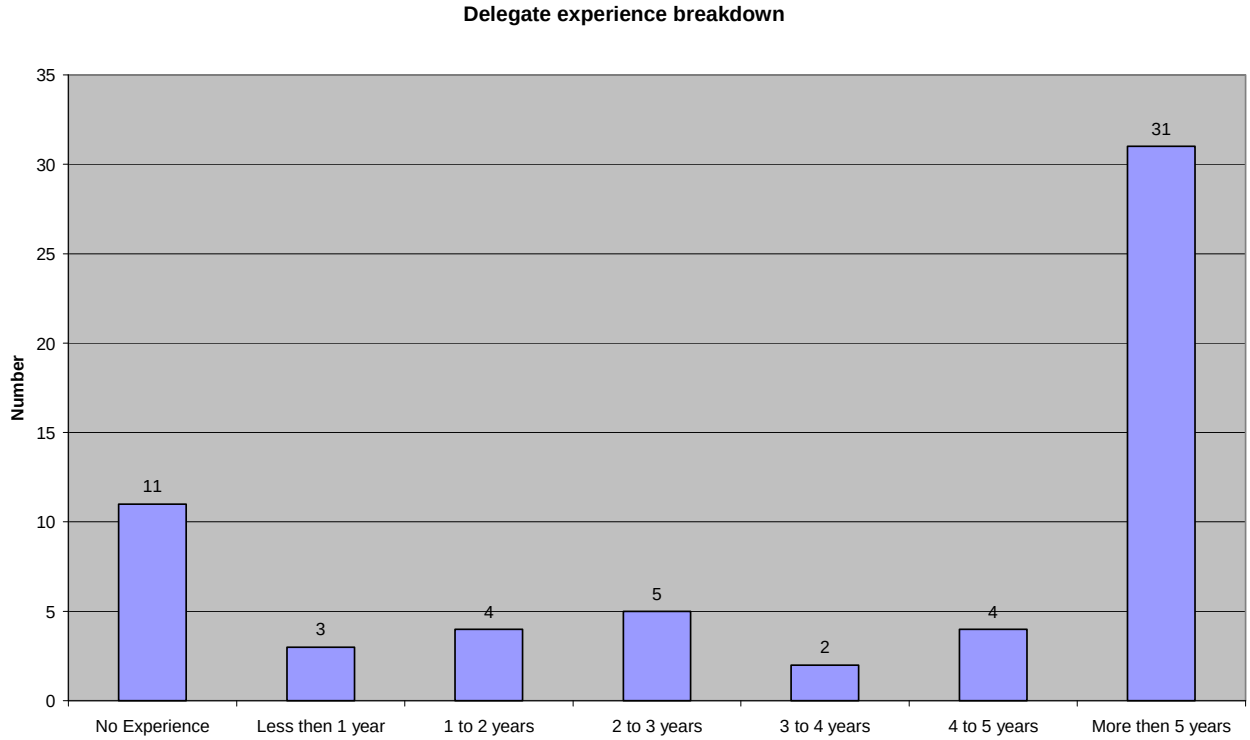

Figure 7

4.4.8 5+ Experience delegate breakdown

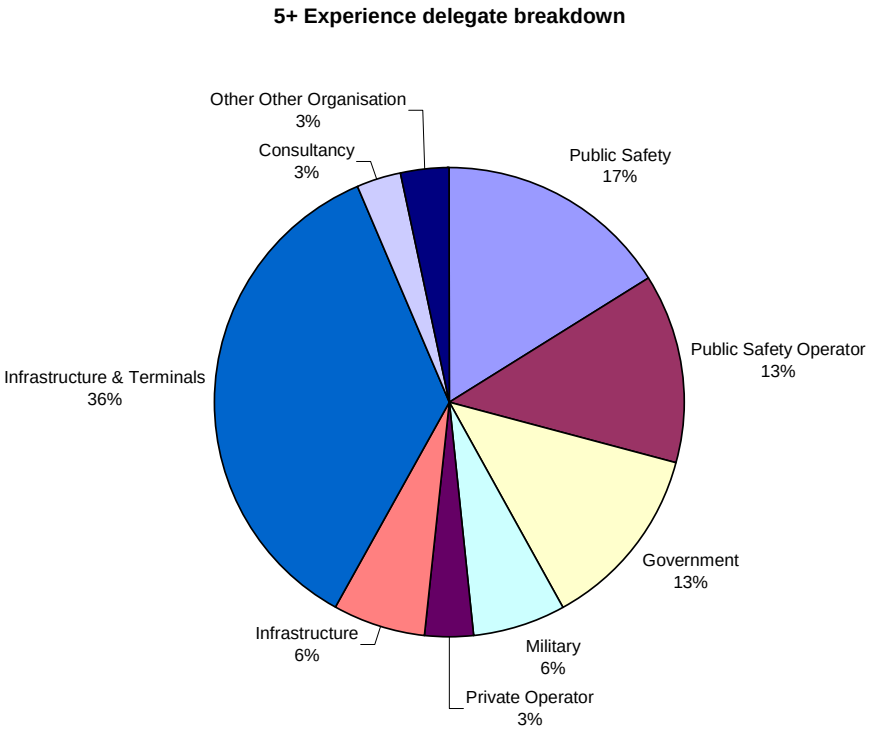

Figure 8

4.4.9 No Experience delegate breakdown

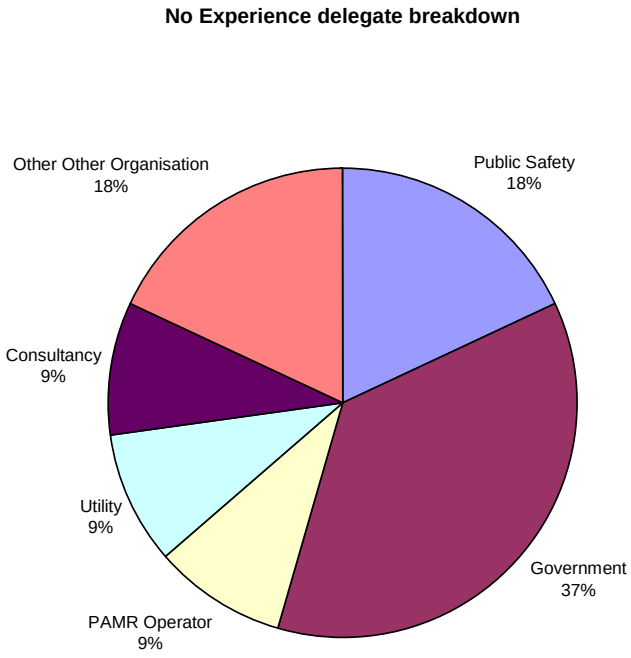

Figure 9

4.4.10 Public Safety and Security User 5+ Experience delegate breakdown

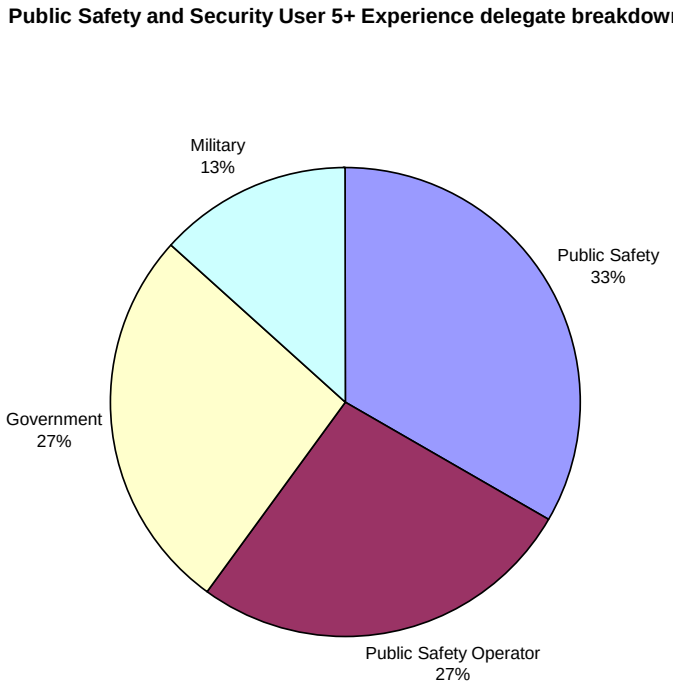

Figure 10

4.4.11 Delegate breakdown remarks

Analysis of the profile of the attendees shows that the transportation sector was under-represented as were the specialist users of the TETRA Direct Mode Operation (DMO) standards.

ETSI TC TETRA is approaching the TETRA Association to use their resources and contacts to reach these parts of the user community.

4.5 Result representation

4.5.1 Global overview results

The global overview results (clause 5, figures 11 to 16) are a graphical pie-chart representation of the average of the expenditure of all workshop participants per questions 1 to 6 from questionnaire 2 and the questions from questionnaire 1.

4.5.2 Weighted results and weighted comparison results

The weighted results (clauses 6 to 13, figures 17 to 59) and the weighted comparison results (clauses 14 to 16, figures 60 to 74) are calculated by averaging the multiplication of the spend value in a certain enhancement (enhancement area from question 1 to 5 from questionnaire 2) by the spend value of the relative importance of the enhancement group to which the enhancement area belongs (question 6 from questionnaire 2) for the considered respondents segment.

The charts use bar representation of the average and the probability interval. The average is the value where the colour of the bar is abruptly changing (from yellow to blue). The bar indicates the 68 % probability interval i.e. arithmetic average plus and minus one standard deviation. In the probability interval calculation it was assumed that the distribution of the answers follow the normal (Gaussian) distribution. The probability interval is a function of the spread and number of the answers for that specific enhancement area. So it is an indication on the agreement, i.e. a narrow interval, or disagreement, i.e. a wide interval, on the relative importance of an enhancement area.

In some cases the scale of the relative importance was selected for an easier comparison so that some interval may exceed the scale and the actual upper interval is indicated by a number next to the corresponding interval bar.

For the weighted comparison results (clauses 14 to 16, figures 60 to 74) three times two pairs of respondent segments are compared. These pairs are chosen because they are supposed to have sometimes opposite requirements. By analysing the differences and similarities between these supposed to be opposite segments, more knowledge can be gained for specific enhancement requirements of one of the two segments. In the charts, the first segment is always represent by the top bar for the specific enhancement area. The enhancement areas are sorted in order of averages of the first segment.

5 Global overview total workshop results

5.1 TMO Network Enhancements all workshop respondents

Question 1 from questionnaire 2.

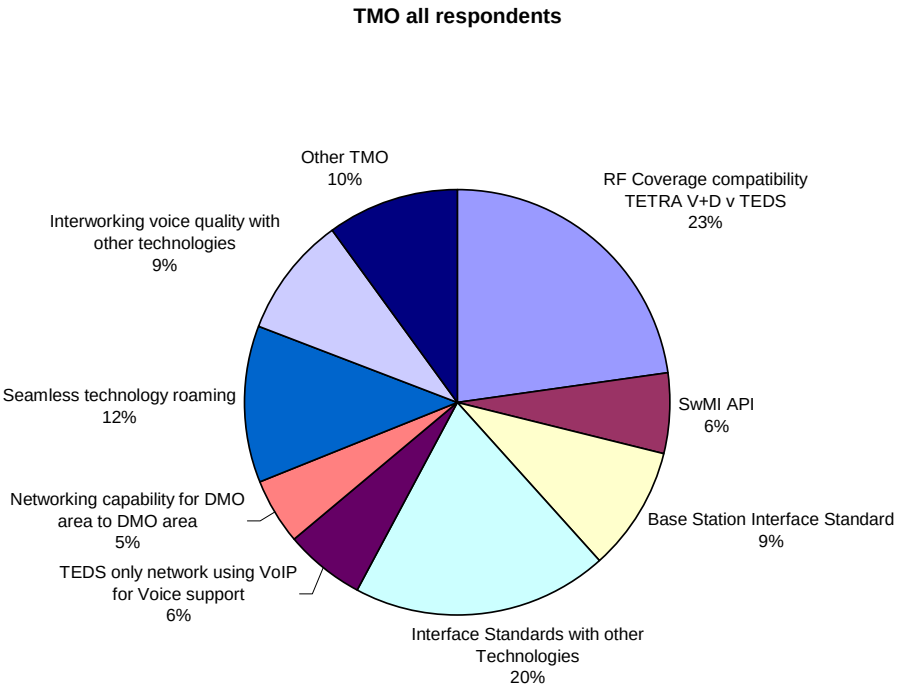

Figure 11

The Other TMO contains:

- Multimode terminal POCSAG capability.
- Simultaneous V+D.
- Reducing Cost of Infrastructure and Ownership (CAPEX/OPEX).
- Paging Devices.
- API for SwMI - MS provisioning tool.
- Call Out.
- Enhancing DMO with the use of TMO.
- Console Interface.

- Logging Recorder.
- Security.

Additional identified issues in relation to TMO network enhancements:

- POCSAG 380 MHz to 460 MHz.

5.2 DMO Enhancements all workshop respondents

Question 2 from questionnaire 2.

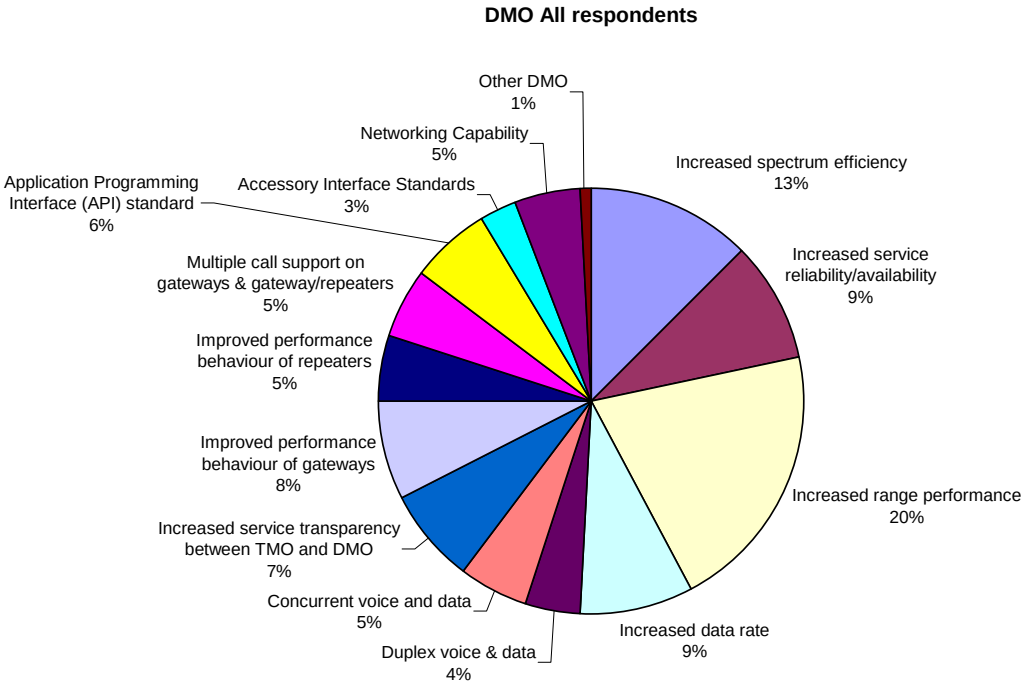

Figure 12

The Other DMO contains:

- Mesh Type Enhancement TMO/DMO.
- Dual Scanning.

Additional identified issues in relation to the DMO enhancements:

- Accessory inteface standard (Bluetooth®, etc.).

5.3 Data Enhancements all workshop respondents

Question 3 from questionnaire 2.

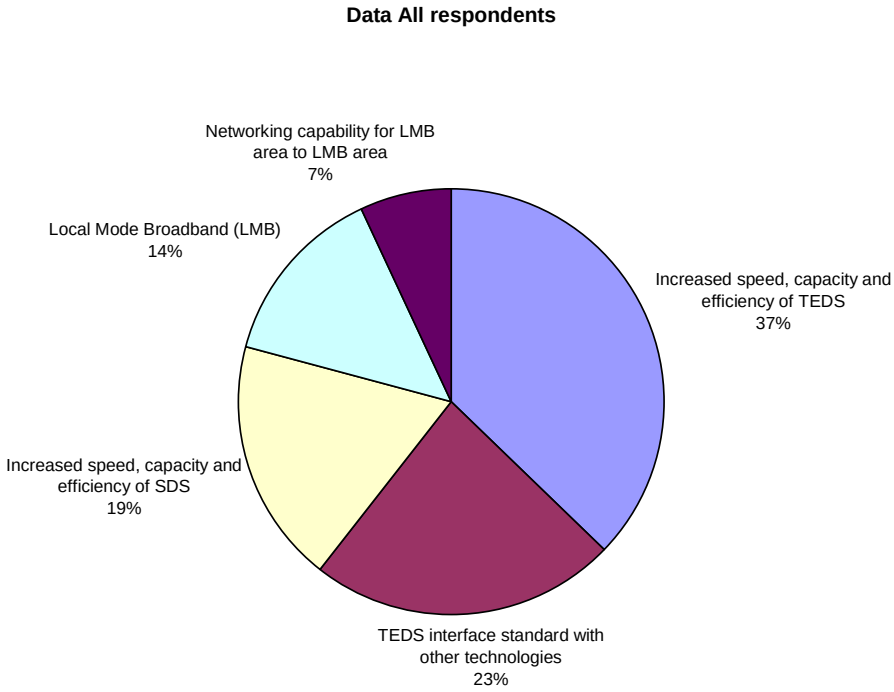

Figure 13

There were also units allocated to:

- Understanding optimum way of offering HSD (TETRA + WBB).
- TETRA V+D with other technologies.

Additional issues in relation to the Data enhancements:

- Next generation data Definition.
- Better response for packet data.
- Time delay of call set-up.
- Packet Data response time.

5.4 General Enhancement Areas all workshop respondents

Question 4 from questionnaire 2.

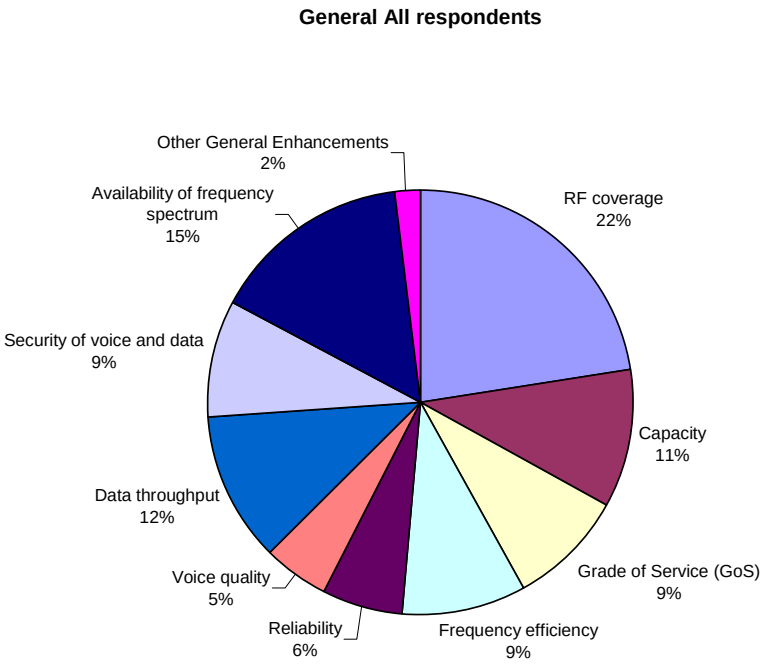

Figure 14

The Other general enhancement contains:

- Low Power BS.

Additional identified issues in relation to the General enhancements:

- Reliability - especially switch solf MTBF control.
- Provision of basic services in areas where no power is available.
- Minimum power implementation in remote areas.

5.5 Industry Performance Enhancements all workshop respondents

Question 5 from questionnaire 2.

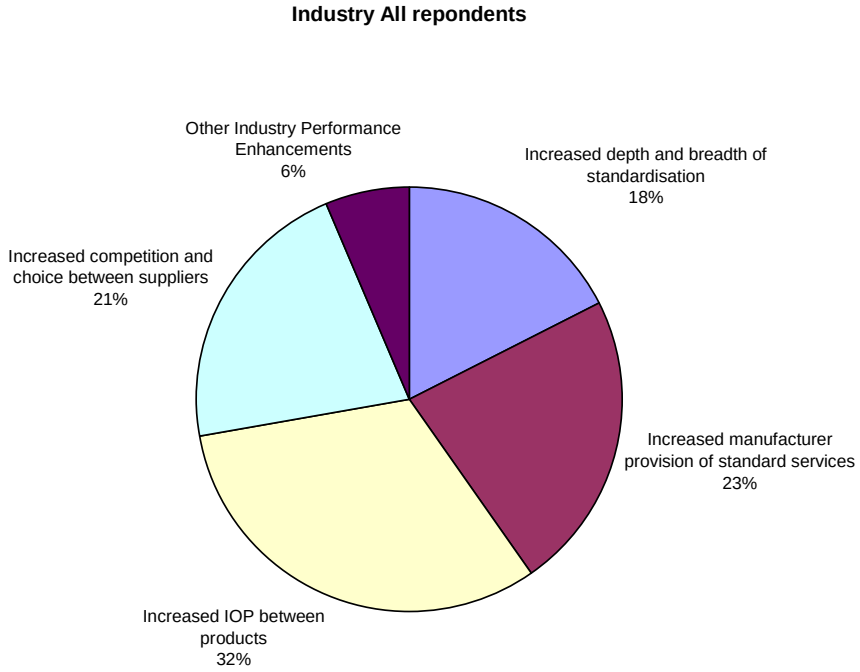

Figure 15

The Other industry performance enhancements contains:

- Call Out implementation/TETRA pager.
- IOP simplified to differentiate, Basic, Mandatory and Optional.
- Security: accreditation and releasability.
- Mandatory.
- Market Specific.
- Streamlined simpler IOP.

Additional identified issues in relation to the Industry performance enhancements:

- Power Enhancement (Solar and Wind Power).
- Call Out Implementation.

5.6 Relative Importance of Enhancements Groups all workshop respondents

Question 6 from questionnaire 2.

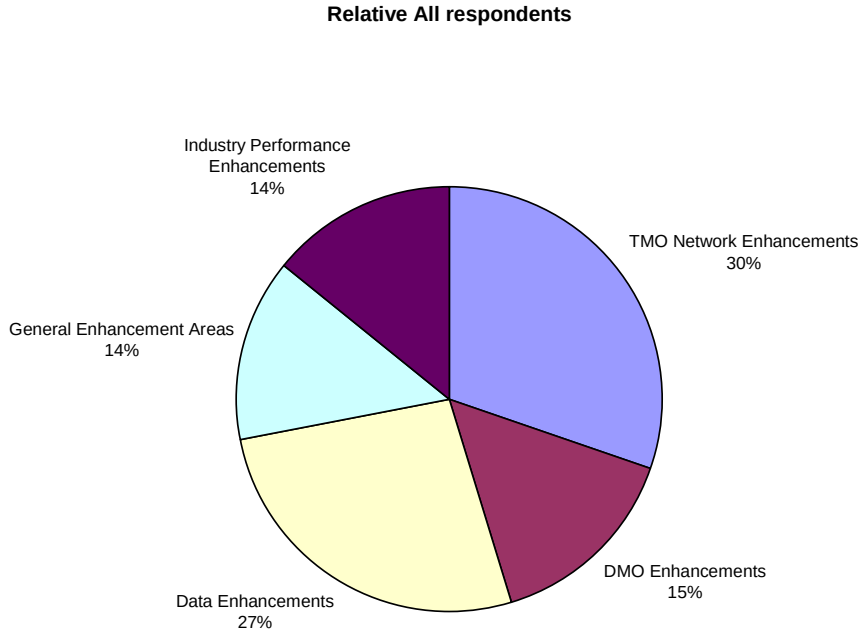

Figure 16

Additional identified issues in relation to the Relative importance of enhancement groups:

- ISI (scored 50 although not permitted in this category).

5.7 Additional comments from all workshop respondents

These are unedited comments that were received on questionnaire 1 and 2:

- This classification is very technical and detailed.
- Future of TETRA longer term requires step up to the strategic level.
- Comparisons with other market alternatives.
- Development trends of customer needs, etc.
- Workshop not rigorous enough to set future of TETRA.
- Future TETRA done more formally using market research.
- ISI is important.
- Vocoding standard with other relavant equipment.
- Accessory inteface standard (Bluetooth®, etc.).
- Existing security protection is acceptable baseline for future.
- Spending 20 units in Call Out function in terminals.
- Capacity: Users cannot use the system if fails.

- Reliability: Must have very high level of reliability of complete service.
- Call Out is extremely important for Fire and Health.
- Standard to provide paging in TETRA must be given high priority.
- In building coverage were no time to prepare i.e. unknown building.
- Reducing costs will help sell TETRA to users of other technologies.
- Main focus network operation with APIs, IPIs, Media Gateways, IMS.
- HSD and TEDS are important facts for us.

6 Weighted results all enhancement areas

The results are presented in clauses 6.1 to 6.8 in figures 17 to 24.

6.1 All respondents all enhancement areas weighted results; questions 1 to 5 from questionnaire 2

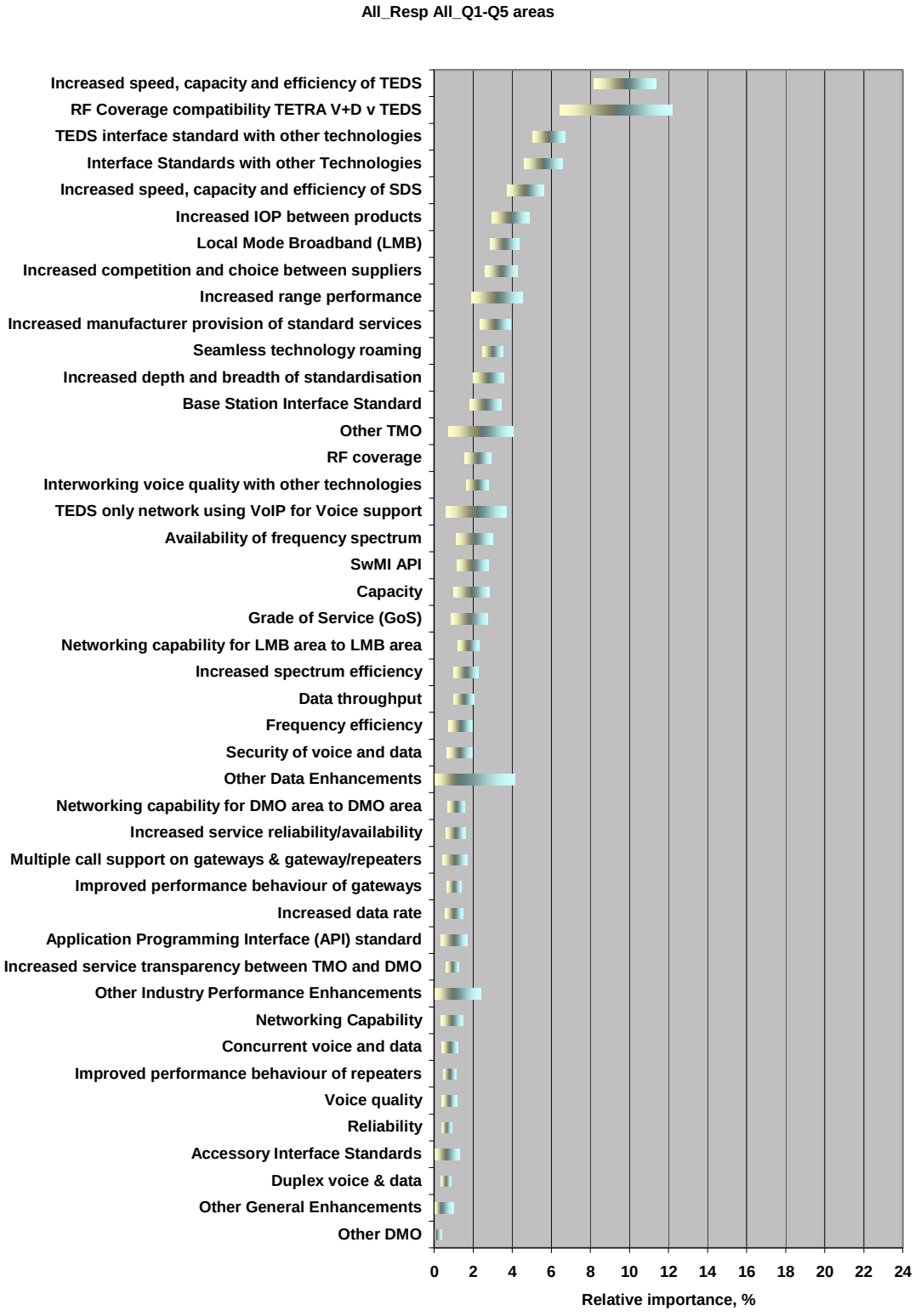

Figure 17

6.2 All User respondents all enhancement areas weighted results; questions 1 to 5 from questionnaire 2

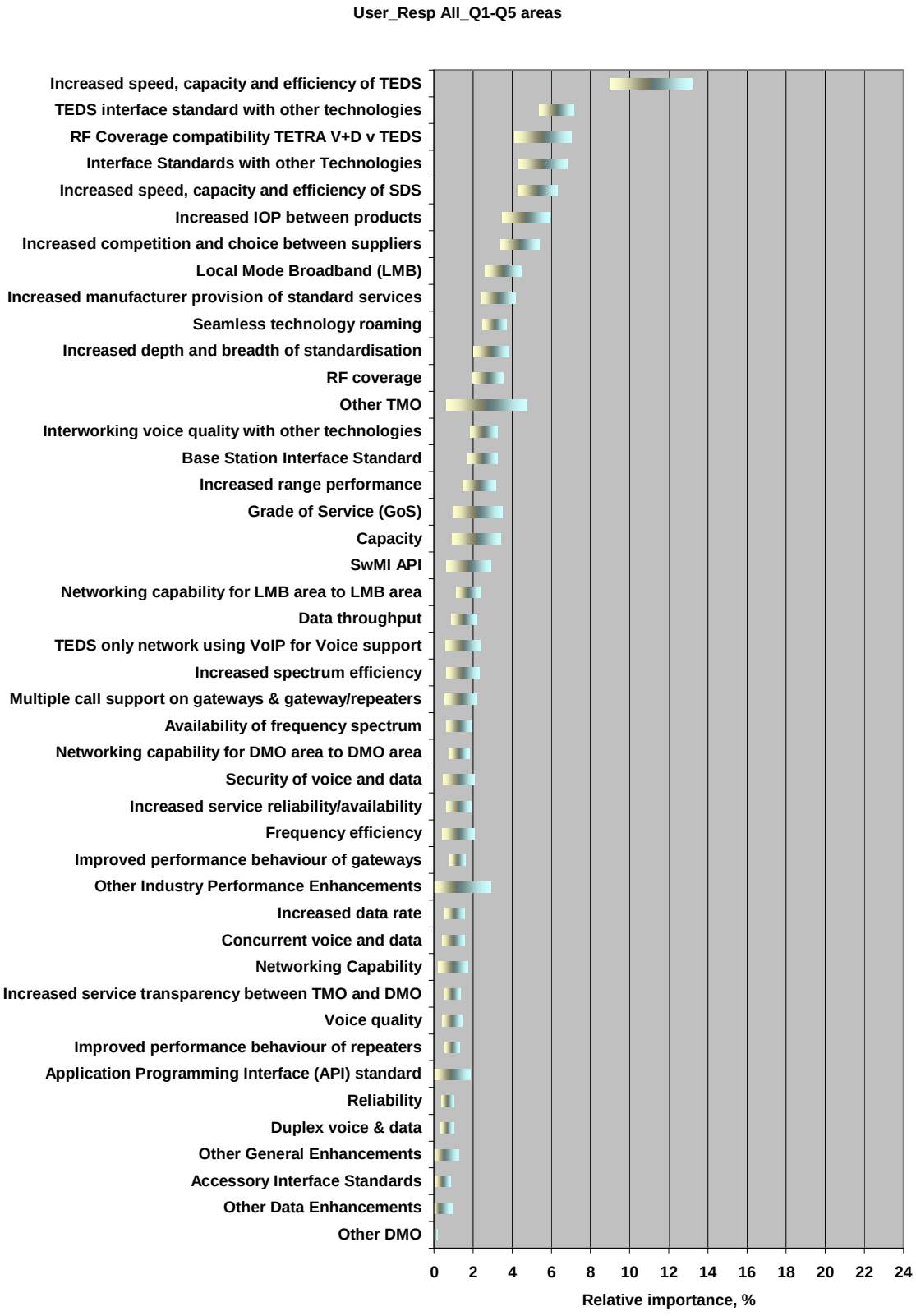

Figure 18

6.3 All Public Safety and Security User all enhancement areas weighted results; questions 1 to 5 from questionnaire 2

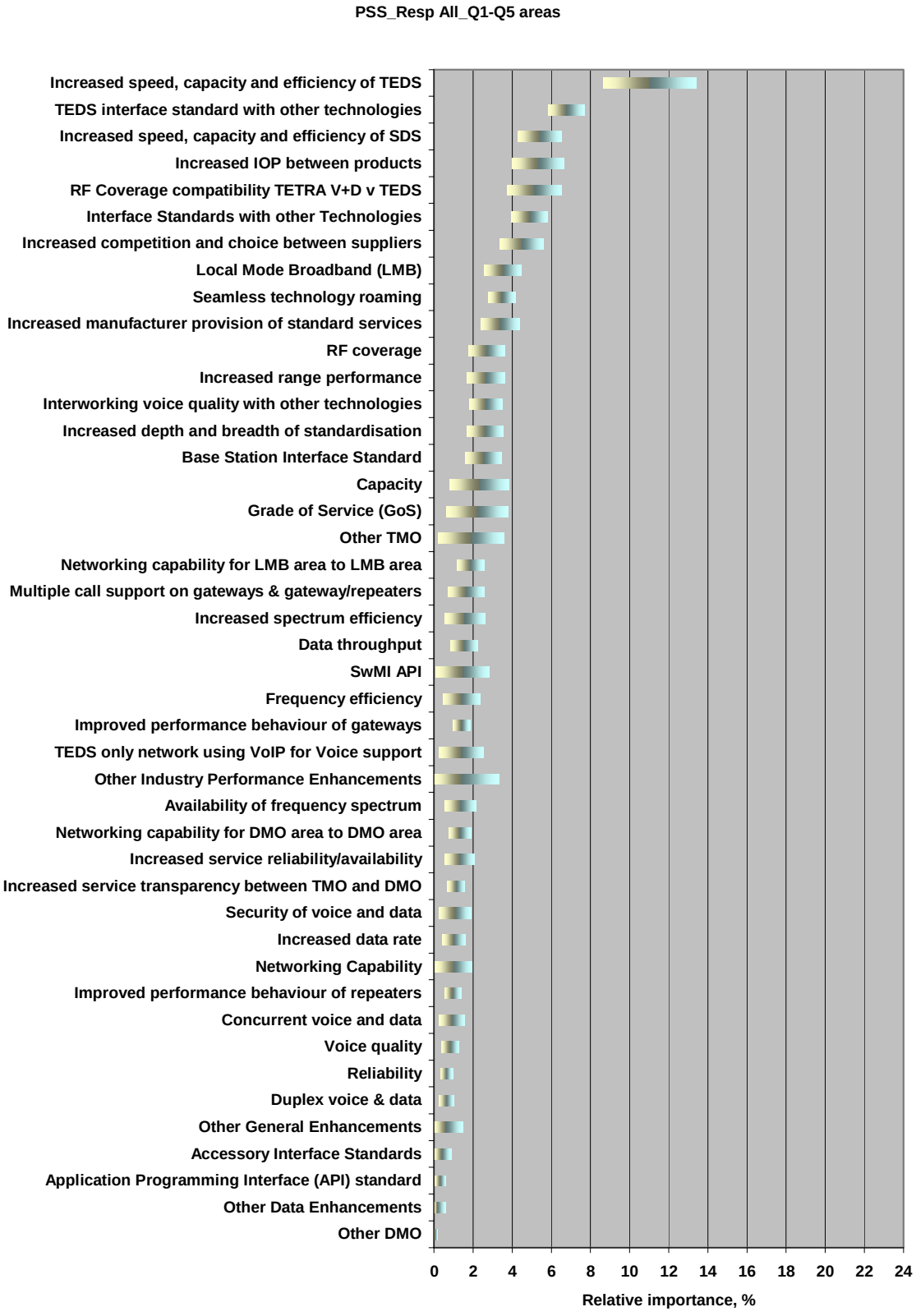

Figure 19

6.4 All Non-Public Safety and Security User all enhancement areas weighted results; questions 1 to 5 questionnaire 2

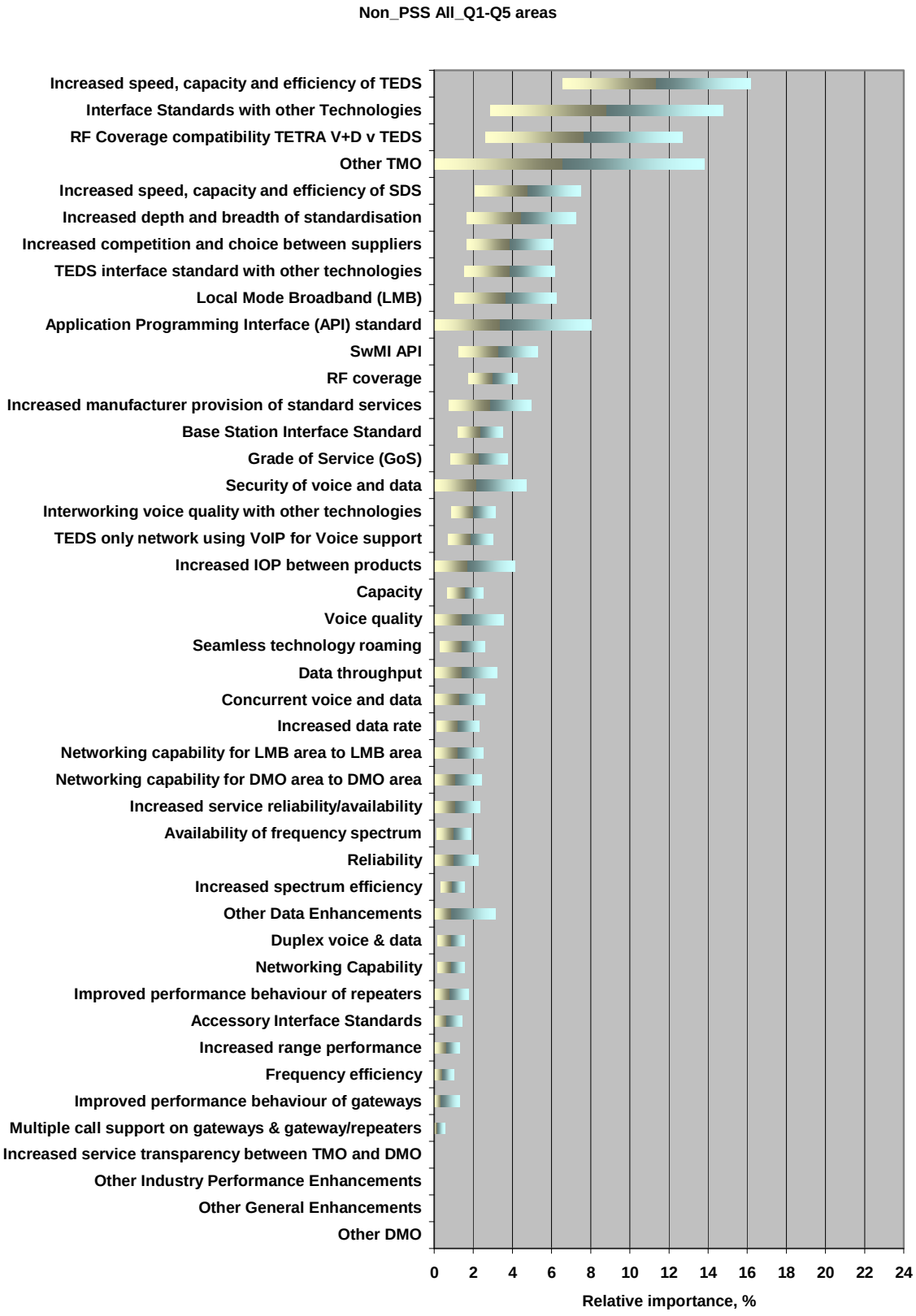

Figure 20

6.5 All Manufacturer/Supplier all enhancement areas weighted results; questions 1 to 5 from questionnaire 2

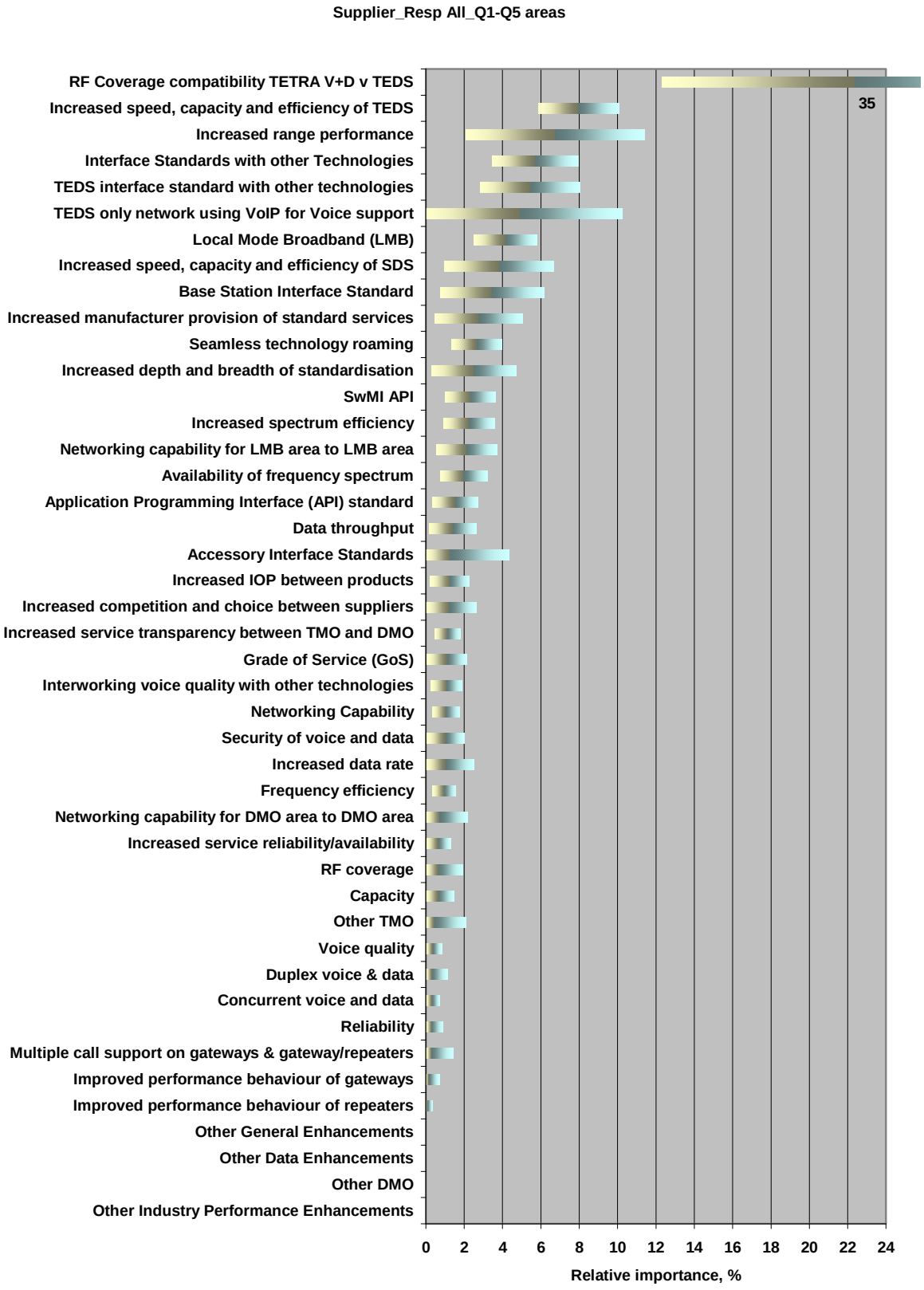

Figure 21

6.6 All 5+ Experience respondents all enhancement areas weighted results; questions 1 to 5 from questionnaire 2

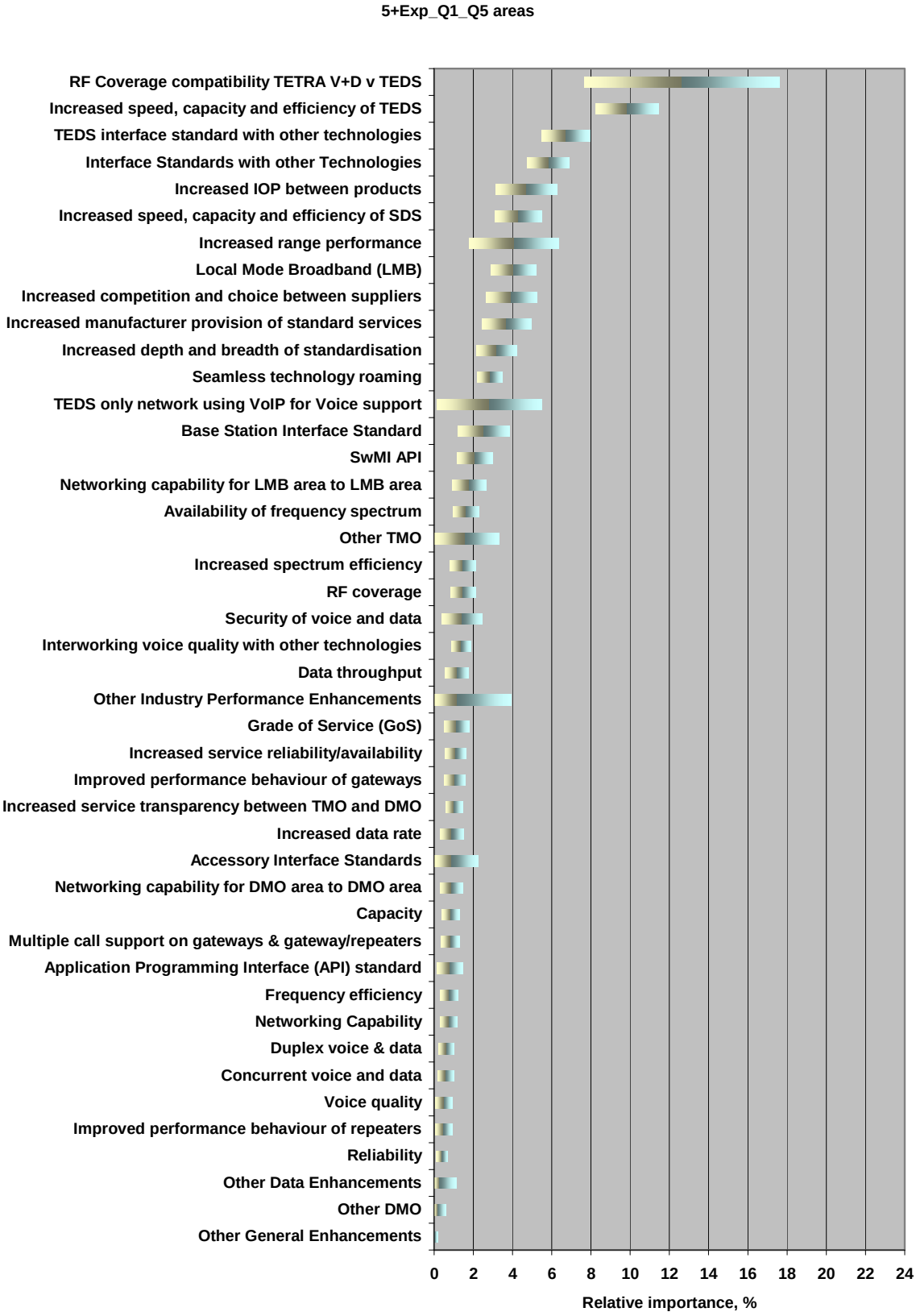

Figure 22

6.7 All No Experience respondents all enhancement areas weighted results; questions 1 to 5 from questionnaire 2

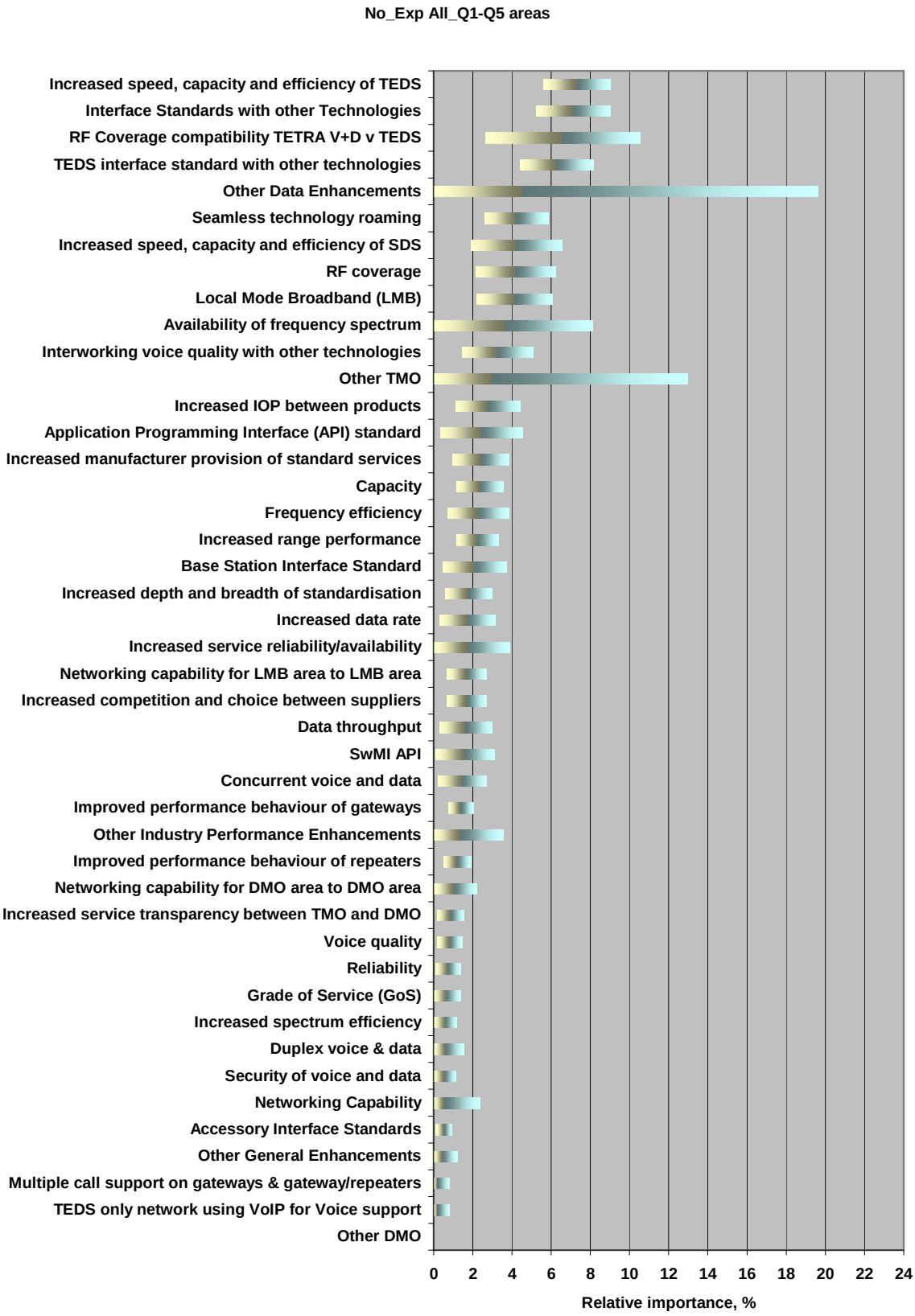

Figure 23

6.8 All Public Safety and Security User 5+ Experience respondents all enhancement areas weighted results; questions 1 to 5 from questionnaire 2

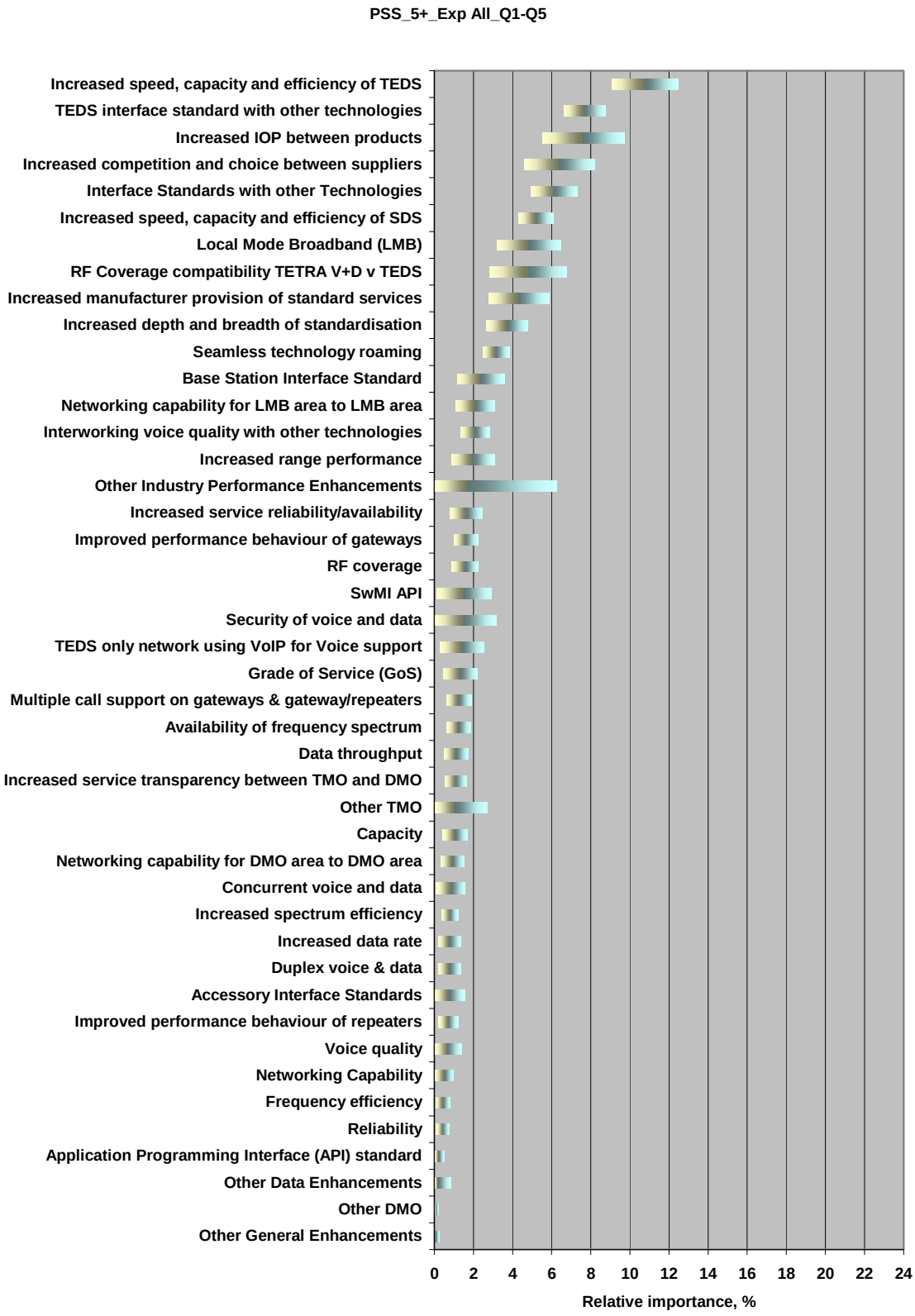

Figure 24

7 Weighted results All User respondents by enhancement area

7.1 Weighted results All User respondents TMO area

Question 1 from questionnaire 2.

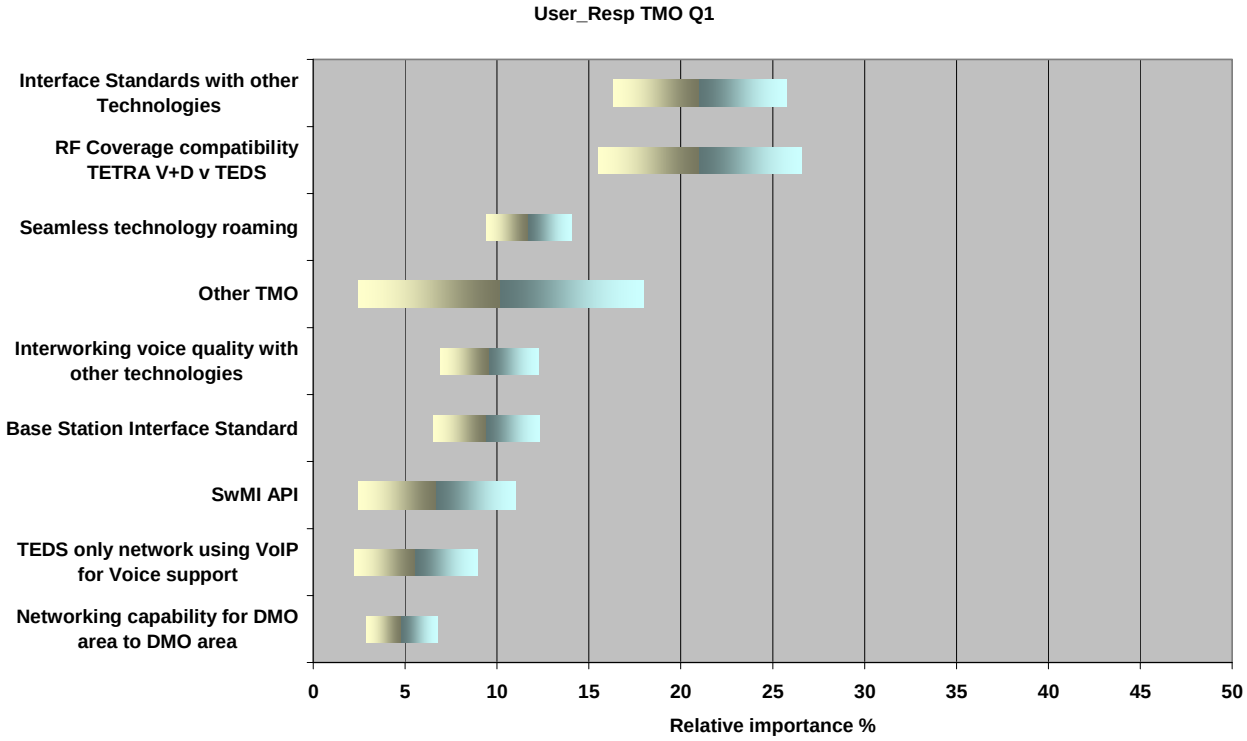

Figure 25

7.2 Weighted results All User respondents DMO area

Question 2 from questionnaire 2.

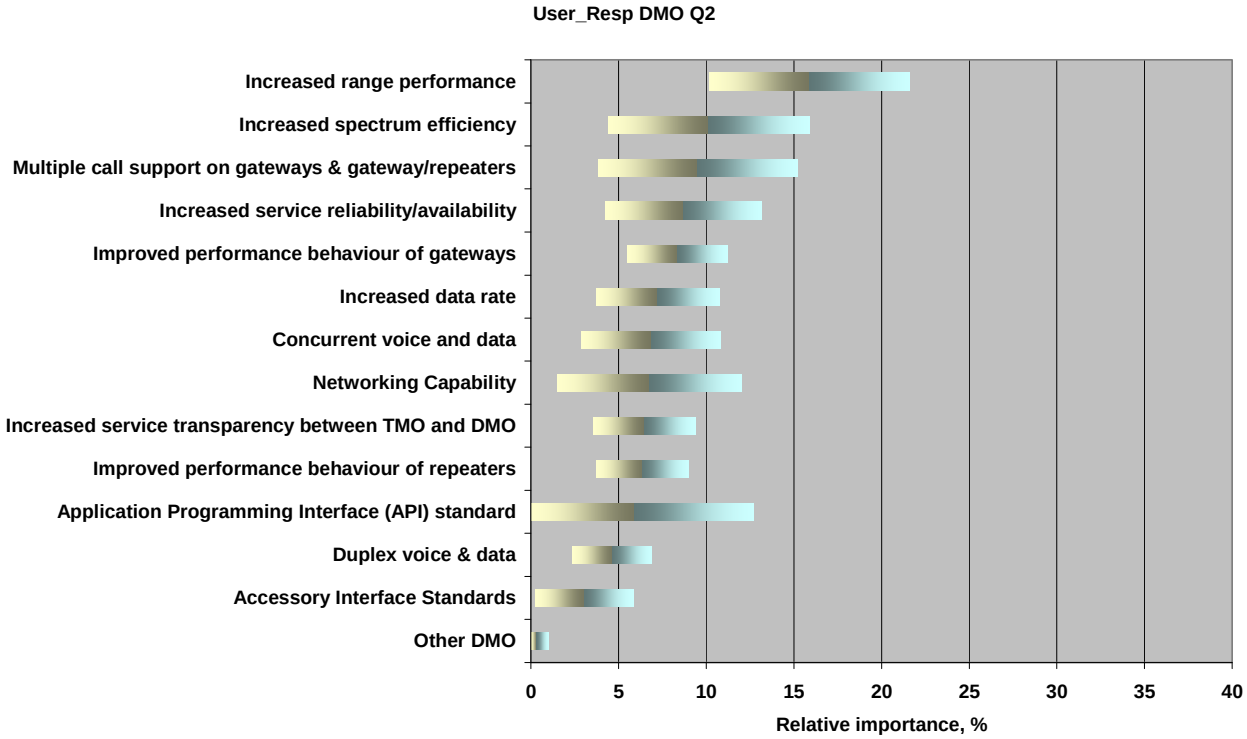

Figure 26

7.3 Weighted results All User respondents Data area

Question 3 from questionnaire 2.

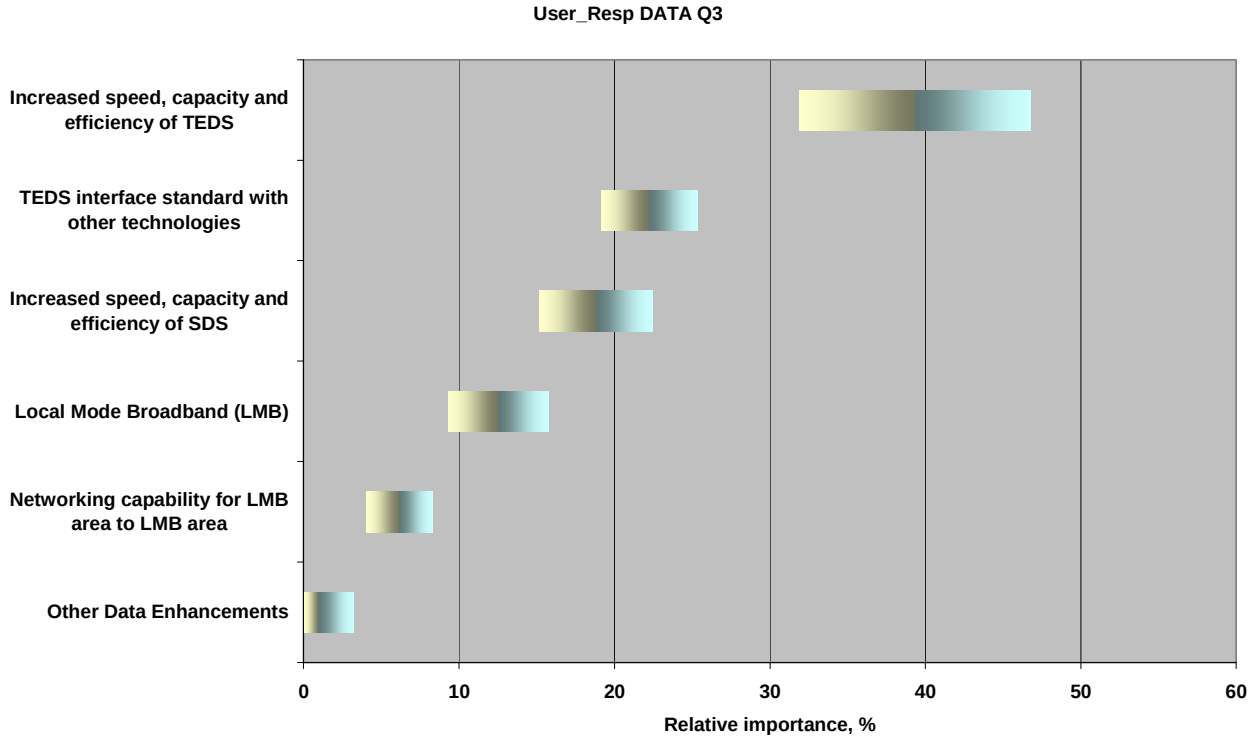

Figure 27

7.4 Weighted results All User respondents General area

Question 4 from questionnaire 2.

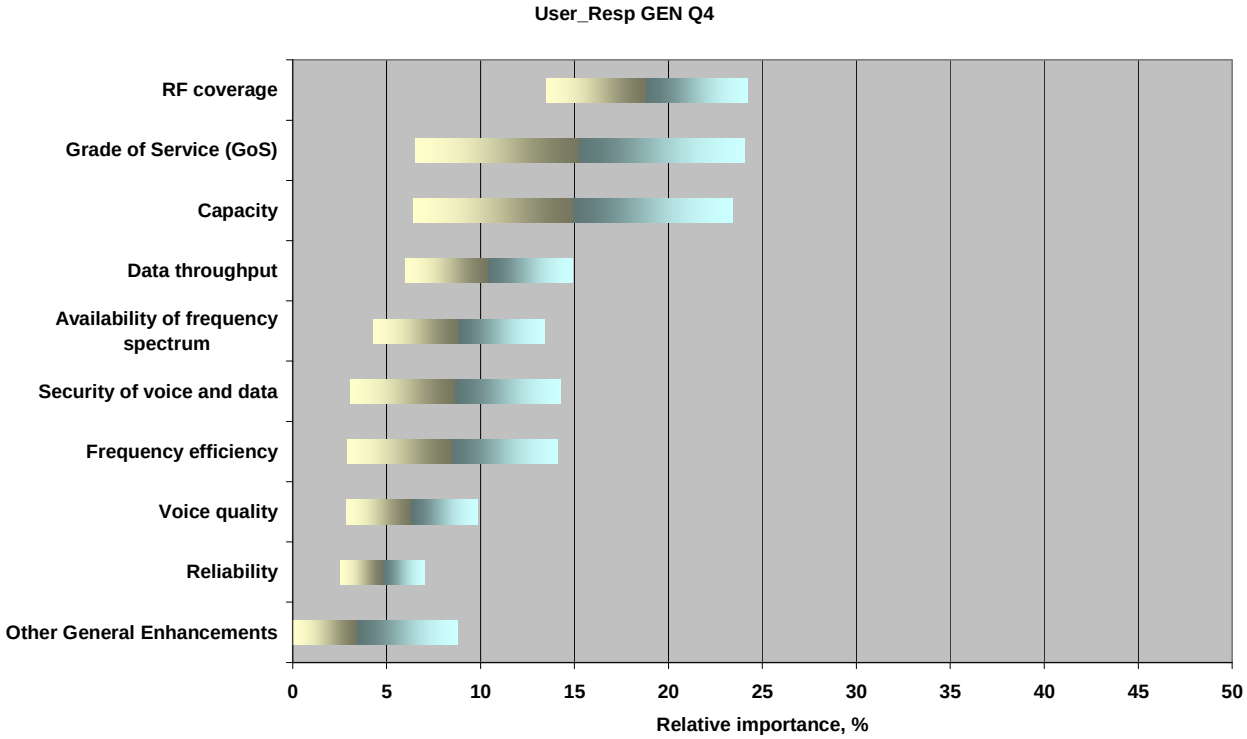

Figure 28

7.5 Weighted results All User respondents Industry area

Question 5 from questionnaire 2.

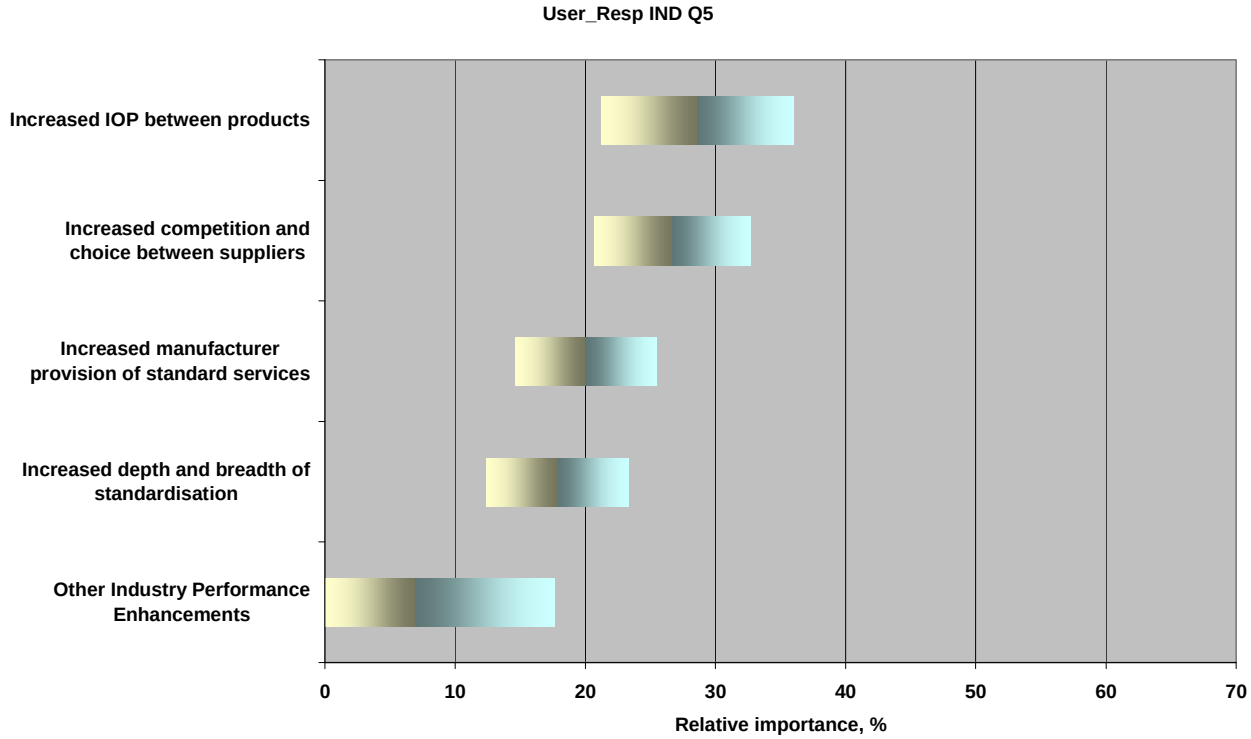

Figure 29

8 Weighted results All Public Safety and Security User respondents by enhancement area

8.1 Weighted results All Public Safety and Security User respondents TMO area

Question 1 from questionnaire 2.

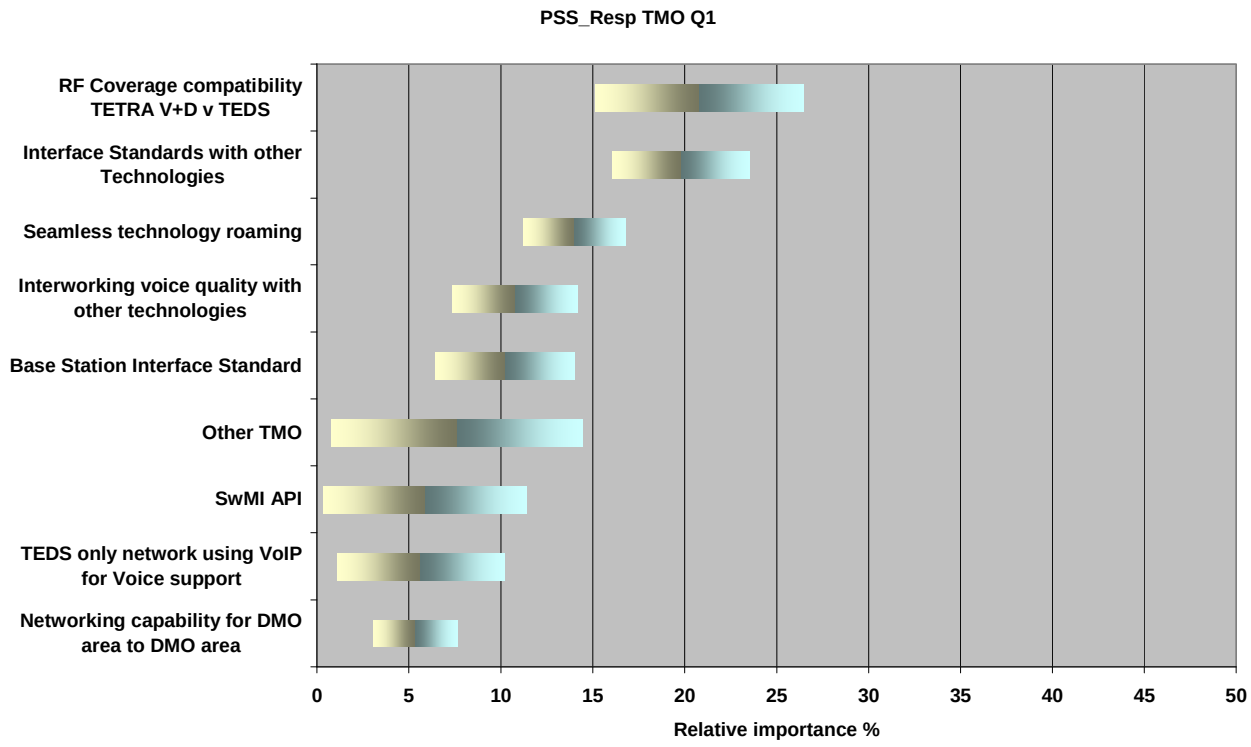

Figure 30

8.2 Weighted results All Public Safety and Security User respondents DMO area

Question 2 from questionnaire 2.

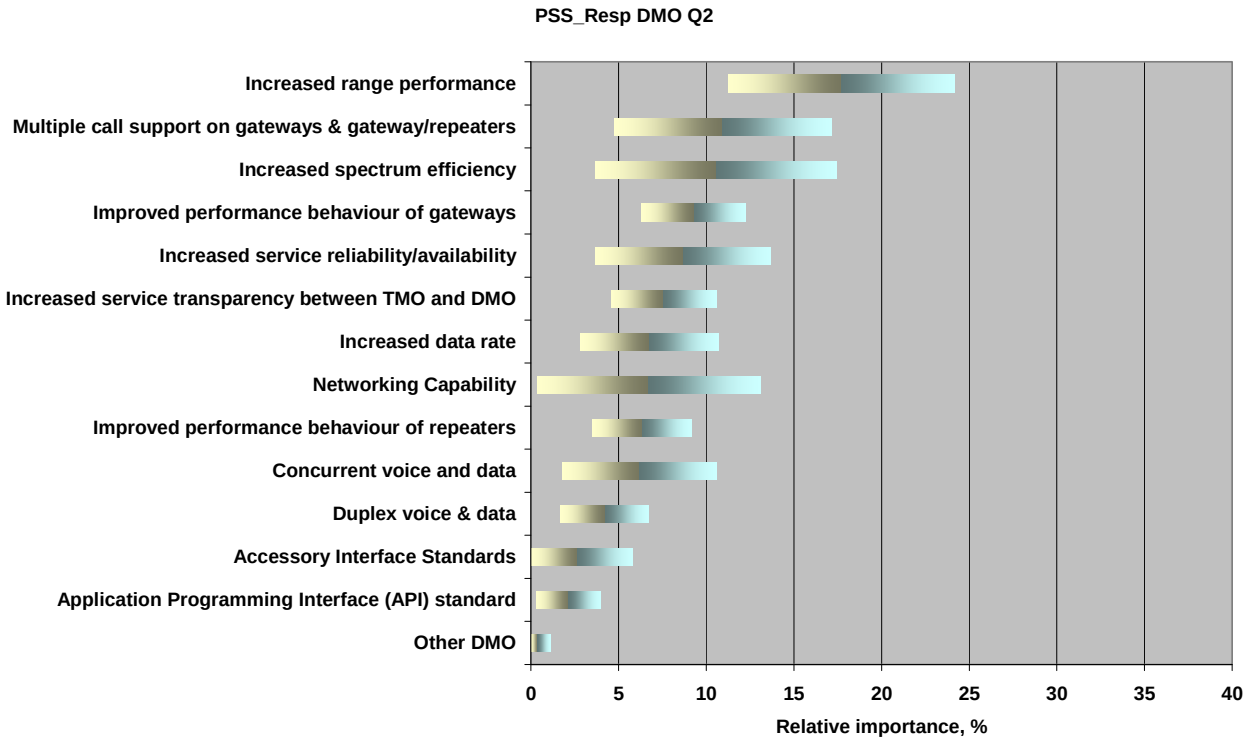

Figure 31

8.3 Weighted results All Public Safety and Security User respondents Data area

Question 3 from questionnaire 2.

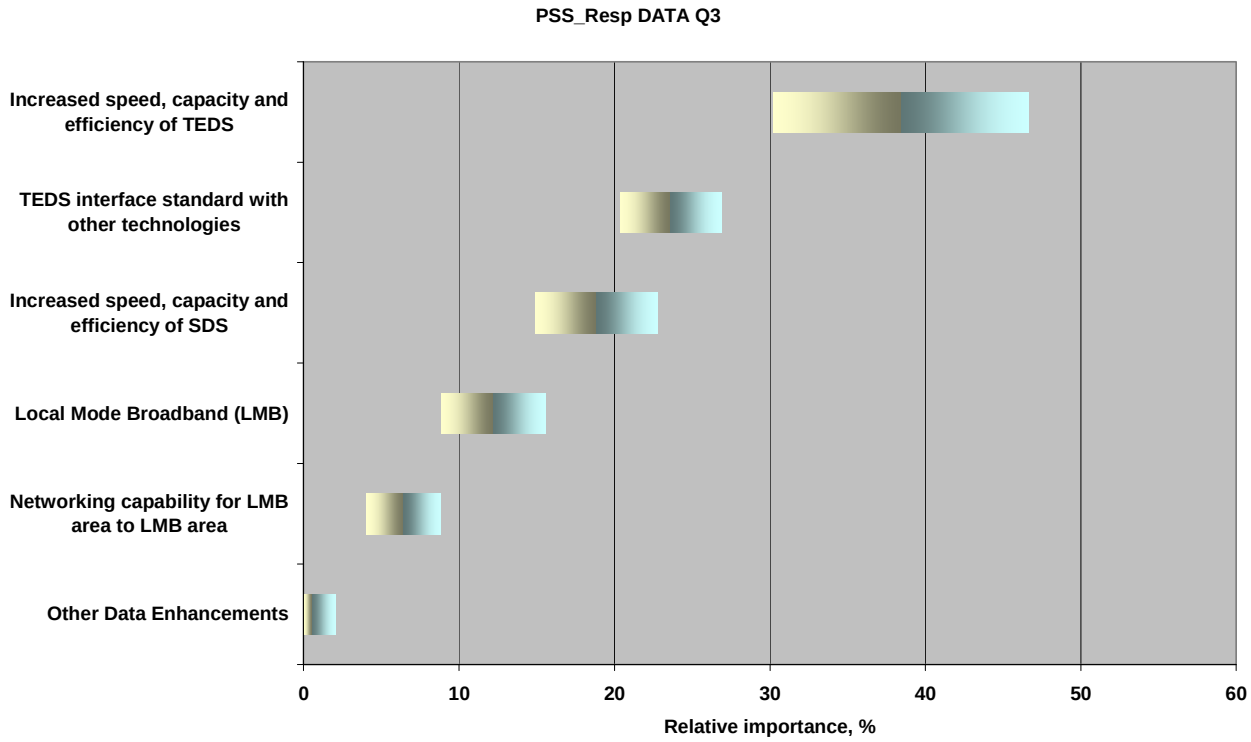

Figure 32

8.4 Weighted results All Public Safety and Security User respondents General area

Question 4 from questionnaire 2.

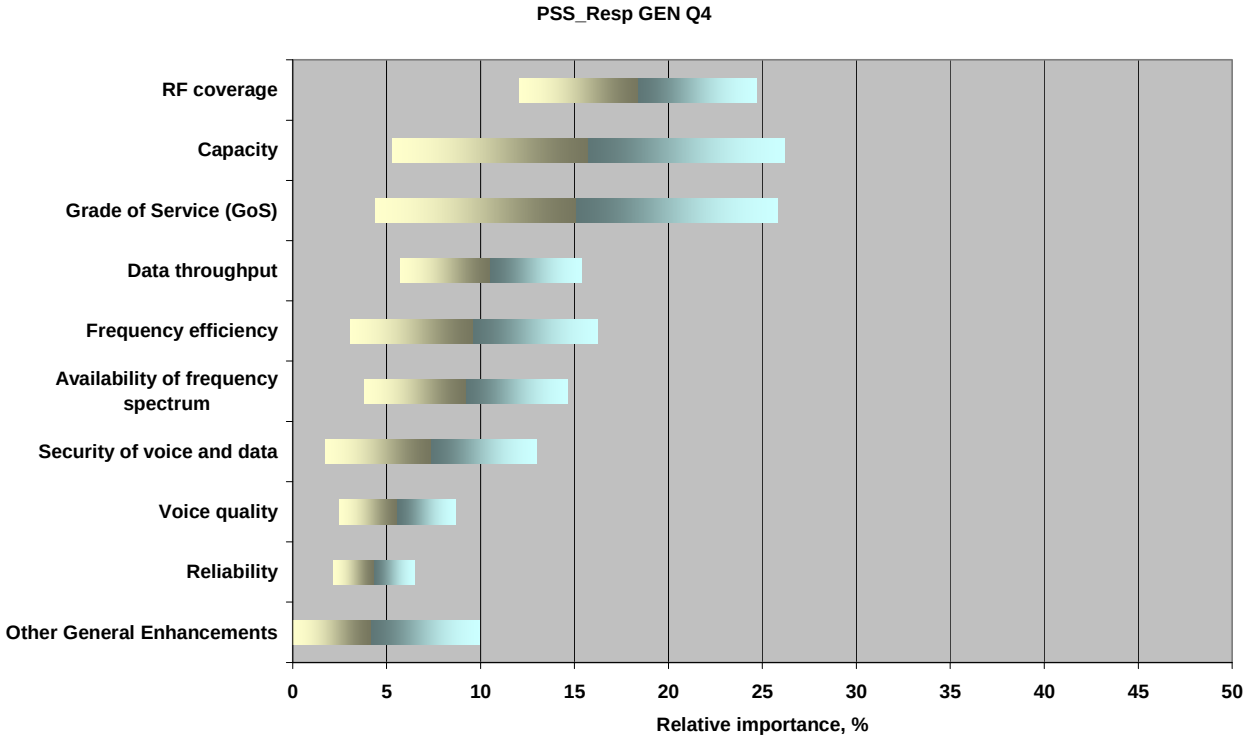

Figure 33

8.5 Weighted results All Public Safety and Security User respondents Industry area

Question 5 from questionnaire 2.

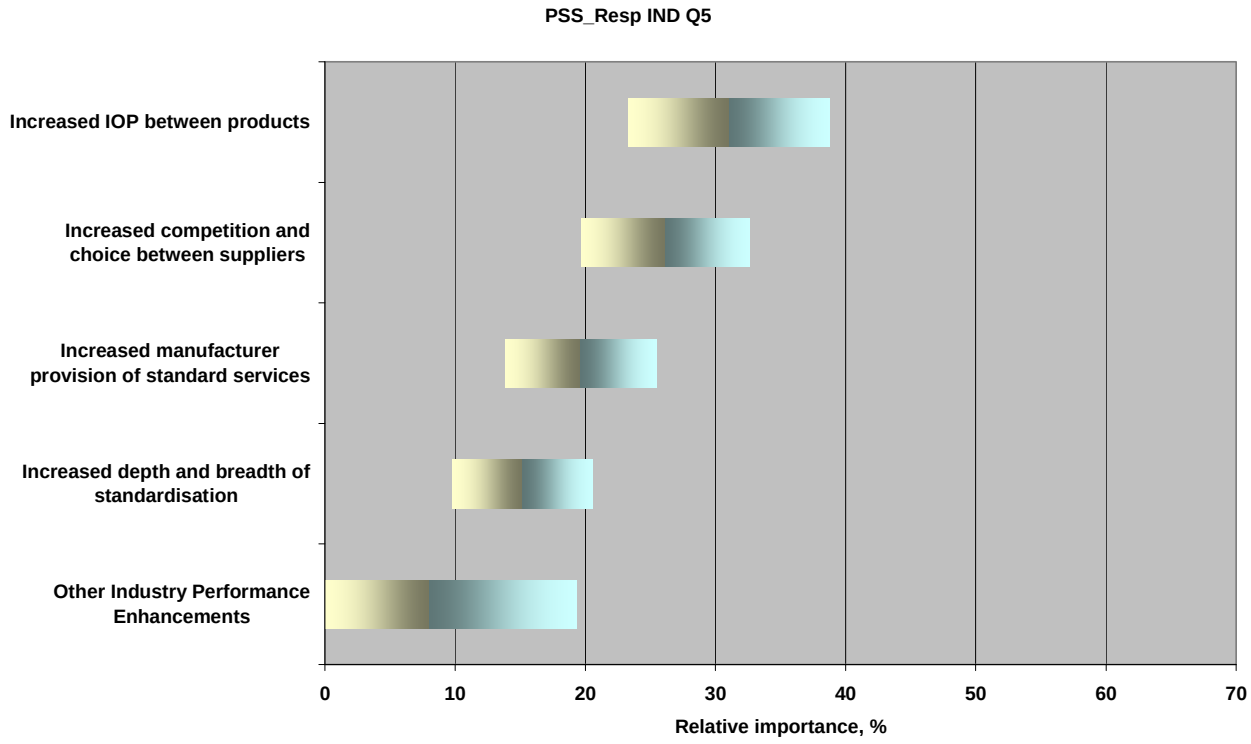

Figure 34

9 Weighted results All Non-Public Safety and Security User respondents by enhancement area

9.1 Weighted results All Non-Public Safety and Security User respondents TMO area

Question 1 from questionnaire 2.

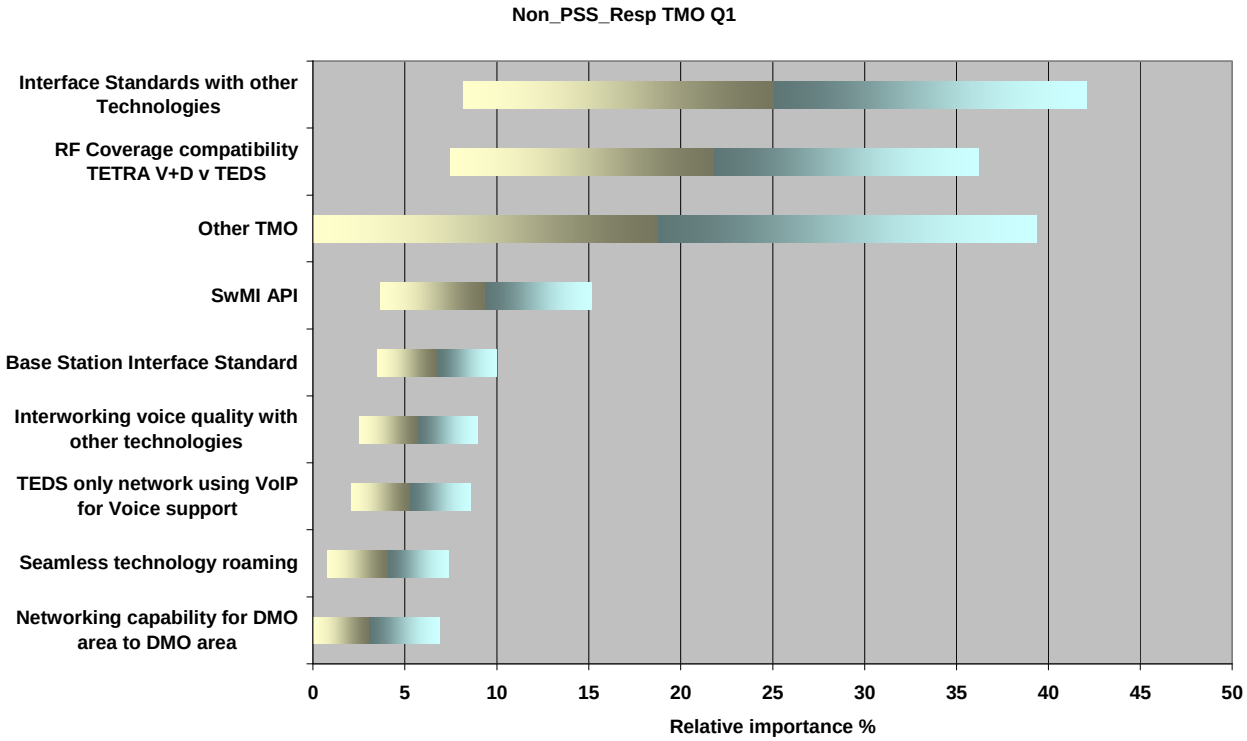

Figure 35

9.2 Weighted results All Non-Public Safety and Security User respondents DMO area

Question 2 from questionnaire 2.

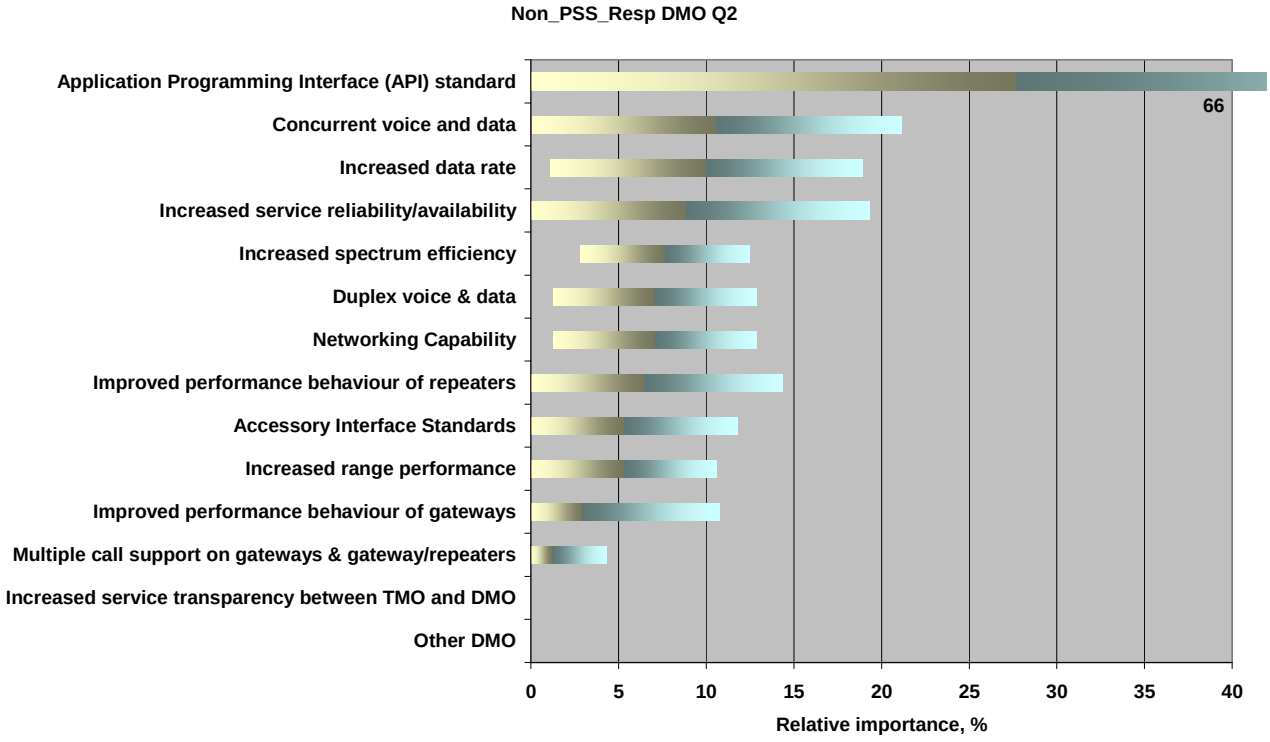

Figure 36

9.3 Weighted results All Non-Public Safety and Security User respondents Data area

Question 3 from questionnaire 2.

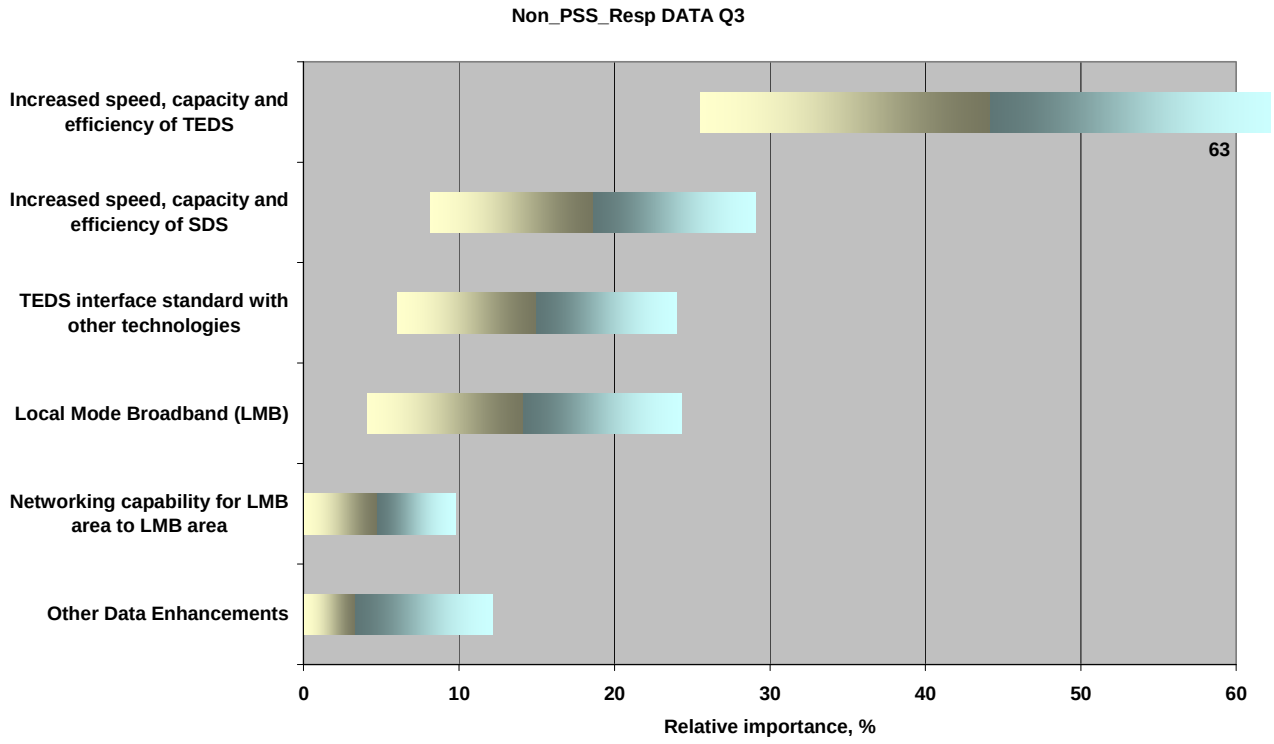

Figure 37

9.4 Weighted results All Non-Public Safety and Security User respondents General area

Question 4 from questionnaire 2.

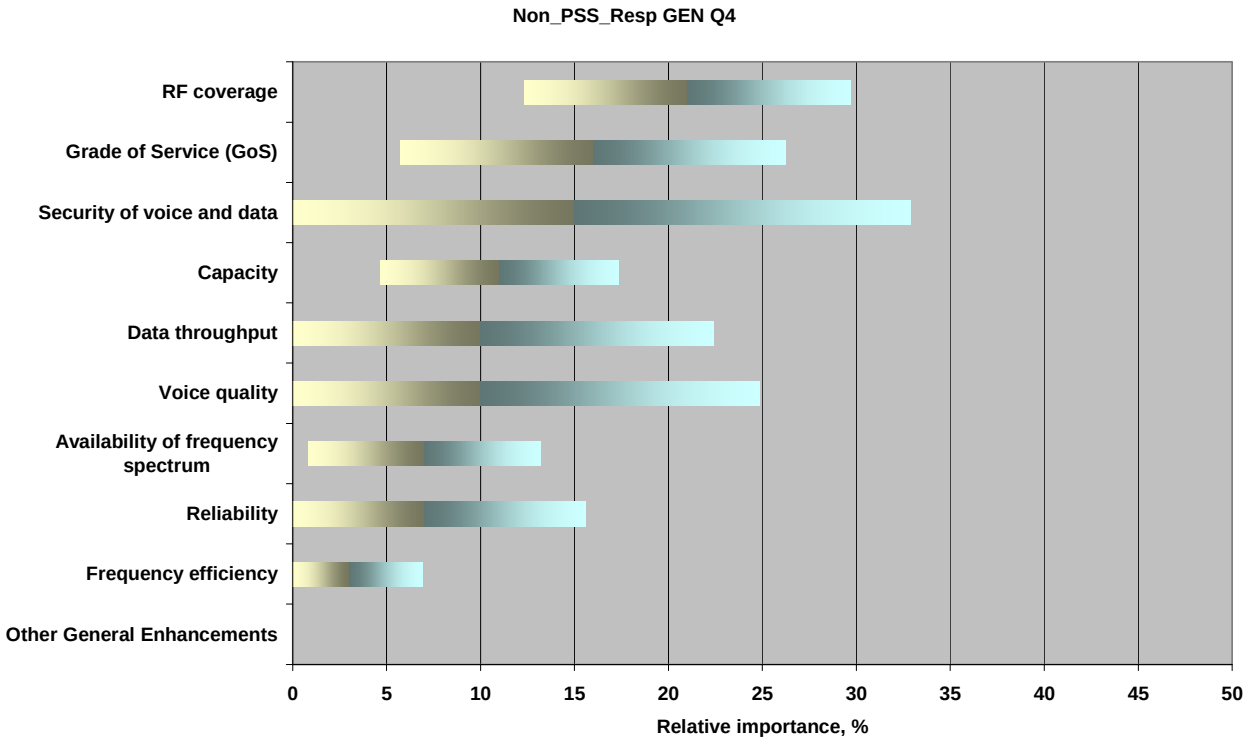

Figure 38

9.5 Weighted results All Non-Public Safety and Security User respondents Industry area

Question 5 from questionnaire 2.

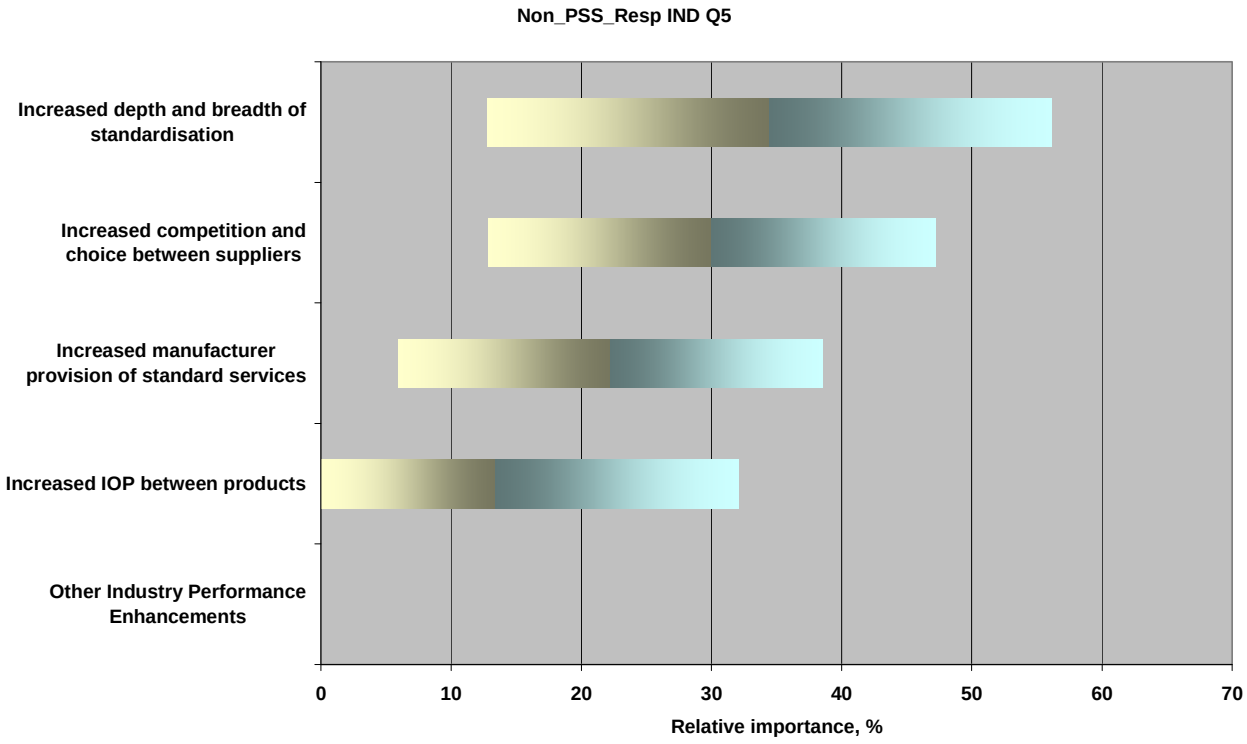

Figure 39

10 Weighted results All Manufacturer/Supplier respondents by enhancement area

10.1 Weighted results All Manufacturer/Supplier respondents TMO area

Question 1 from questionnaire 2.

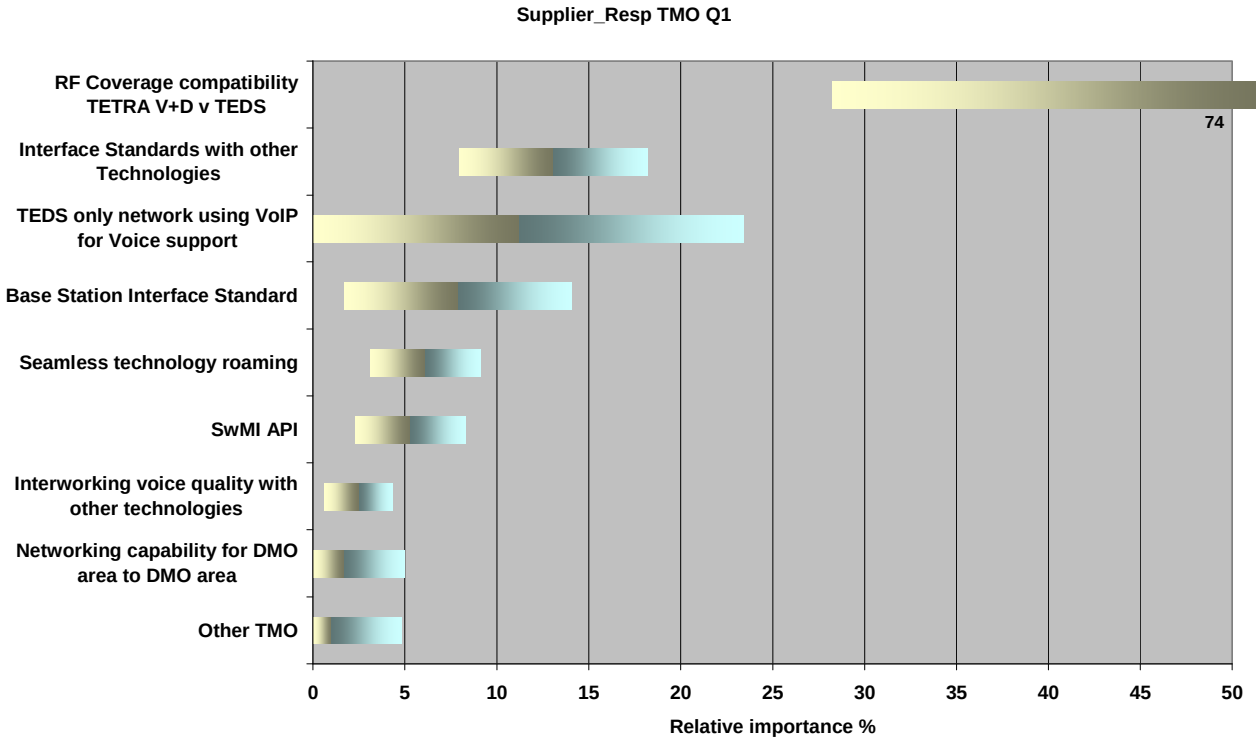

Figure 40

10.2 Weighted results All Manufacturer/Supplier respondents DMO area

Question 2 from questionnaire 2.

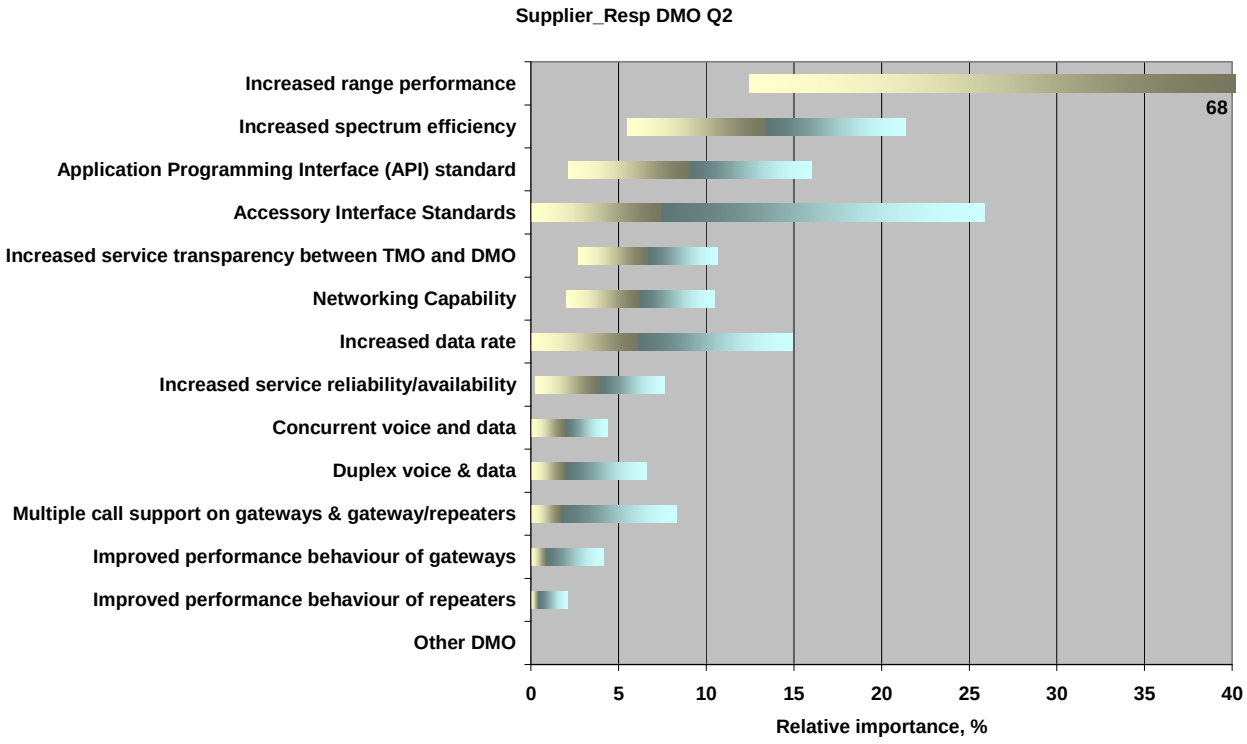

Figure 41

10.3 Weighted results All Manufacturer/Supplier respondents Data area

Question 3 from questionnaire 2.

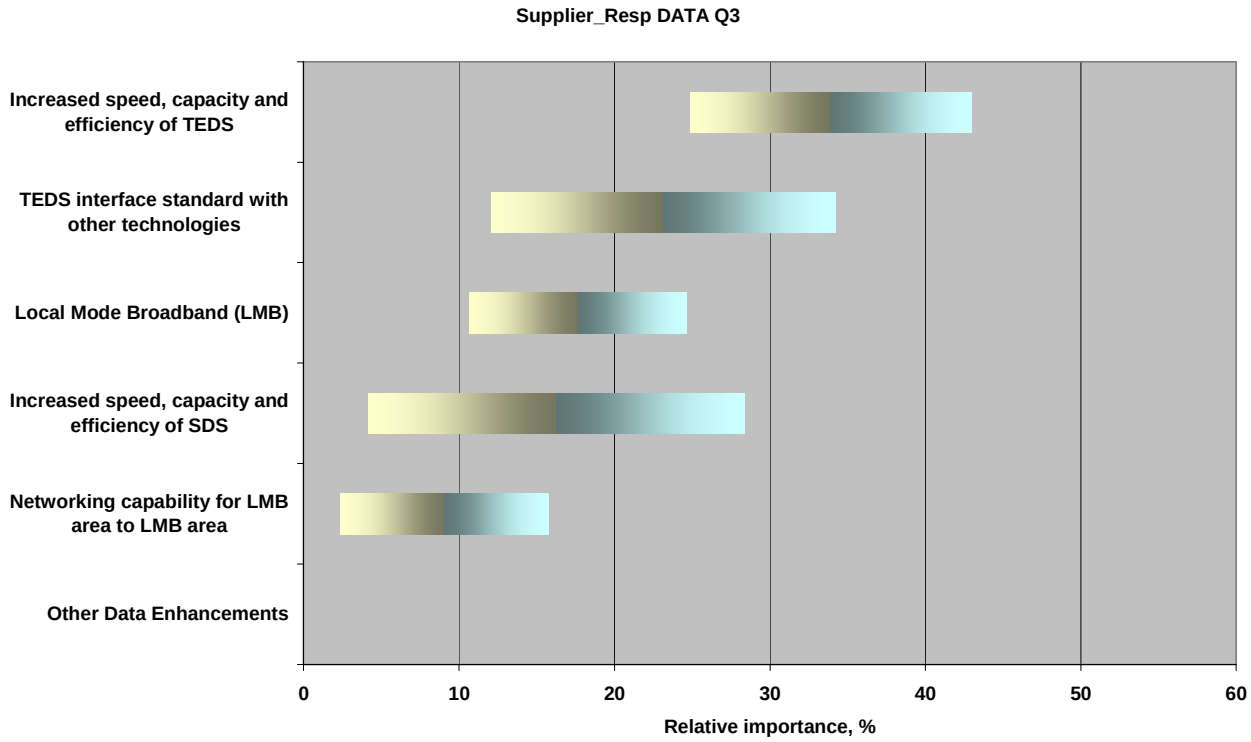

Figure 42

10.4 Weighted results All Manufacturer/Supplier respondents General area

Question 4 from questionnaire 2.

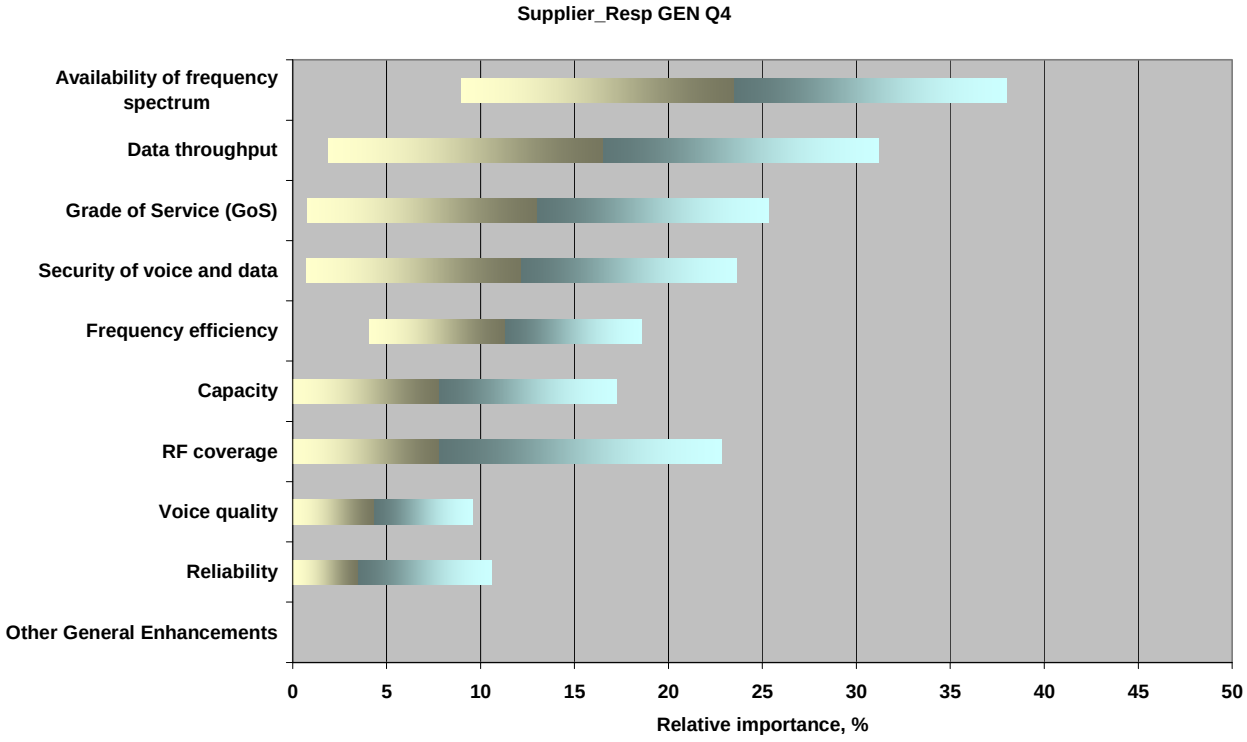

Figure 43

10.5 Weighted results All Manufacturer / Supplier respondents Industry area

Question 5 from questionnaire 2.

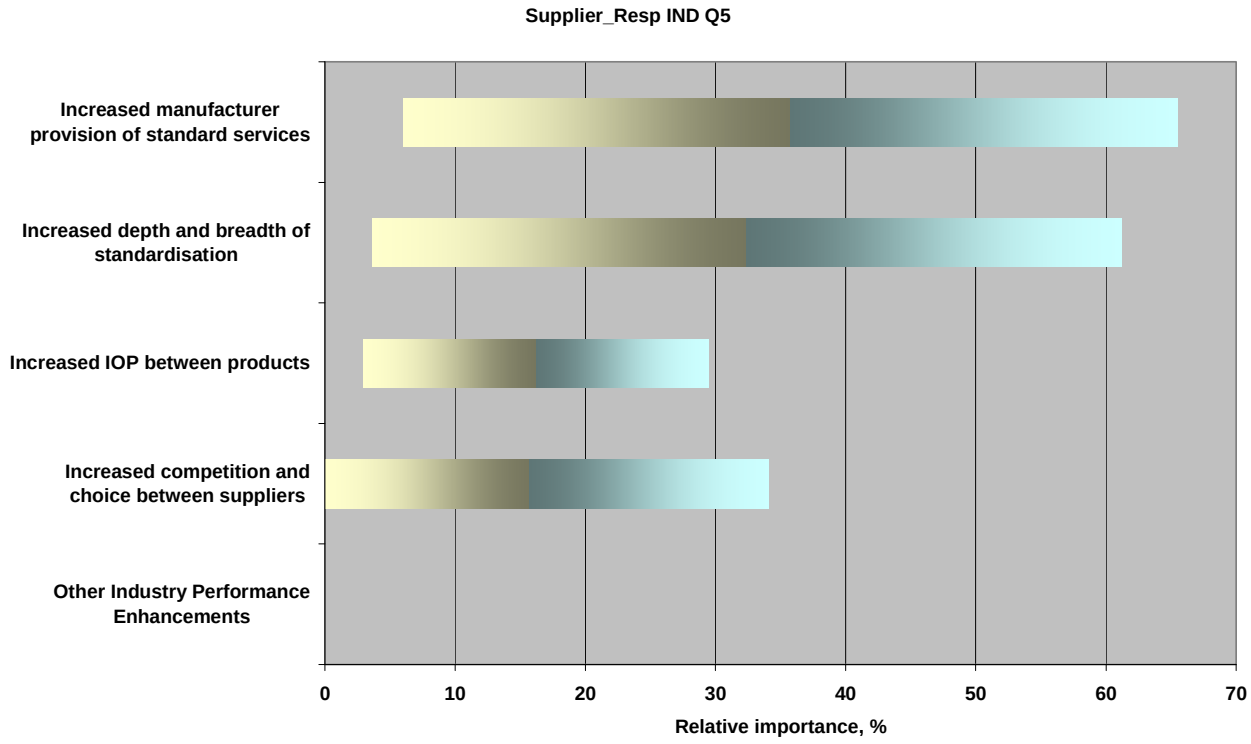

Figure 44

11 Weighted results All 5+ Experience respondents by enhancement area

11.1 Weighted results All 5+ Experience respondents TMO area

Question 1 from questionnaire 2.

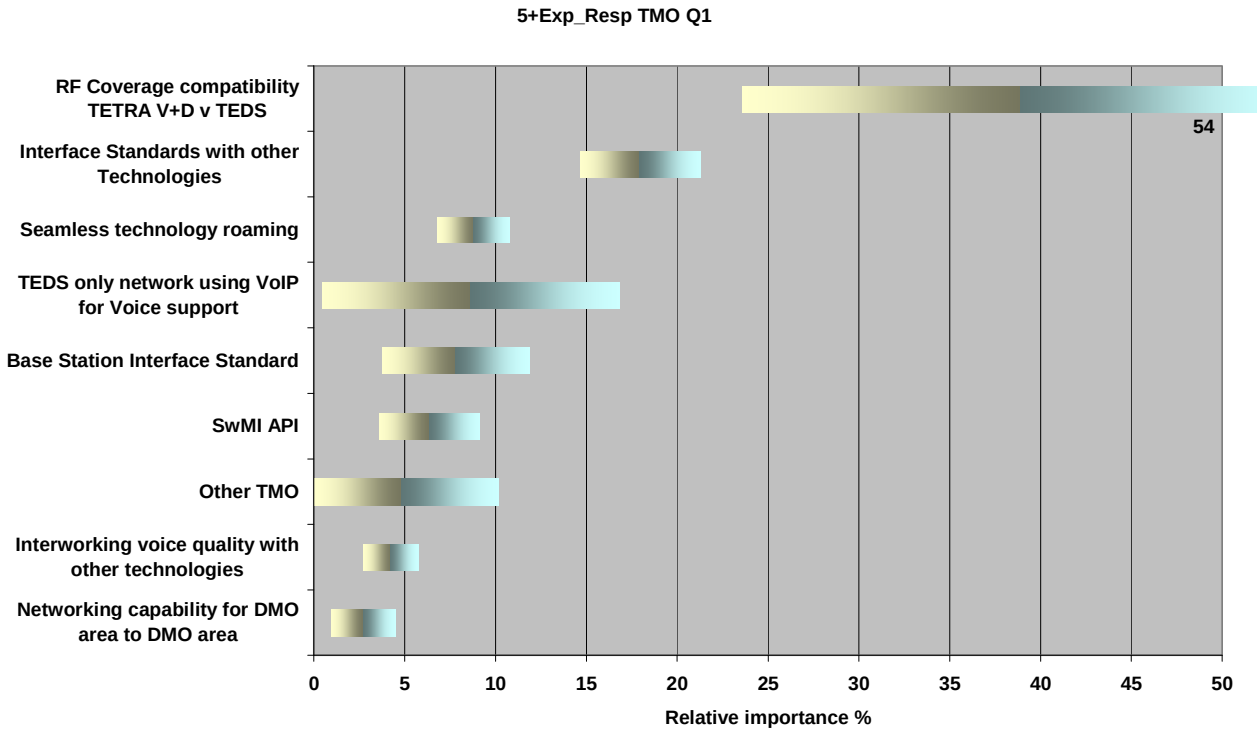

Figure 45

11.2 Weighted results All 5+ Experience respondents DMO area

Question 2 from questionnaire 2.

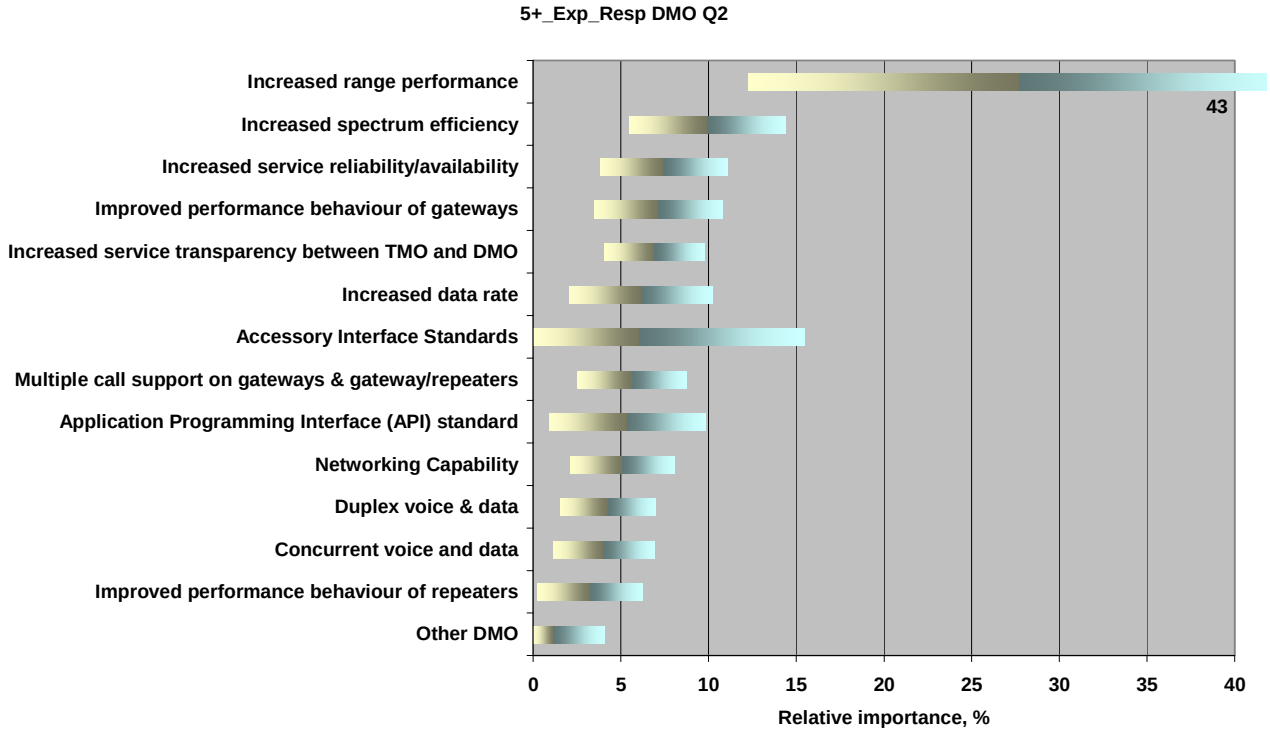

Figure 46

11.3 Weighted results All 5+ Experience respondents Data area

Question 3 from questionnaire 2.

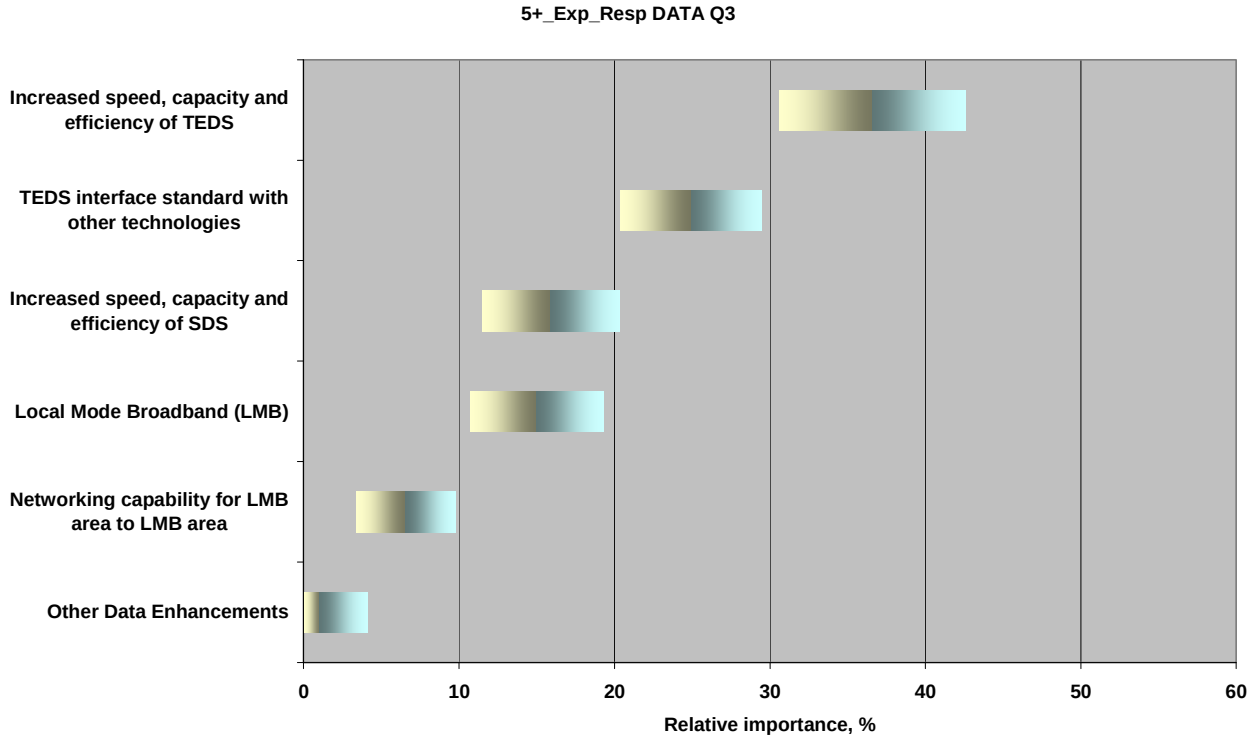

Figure 47

11.4 Weighted results All 5+ Experience respondents General area

Question 4 from questionnaire 2.

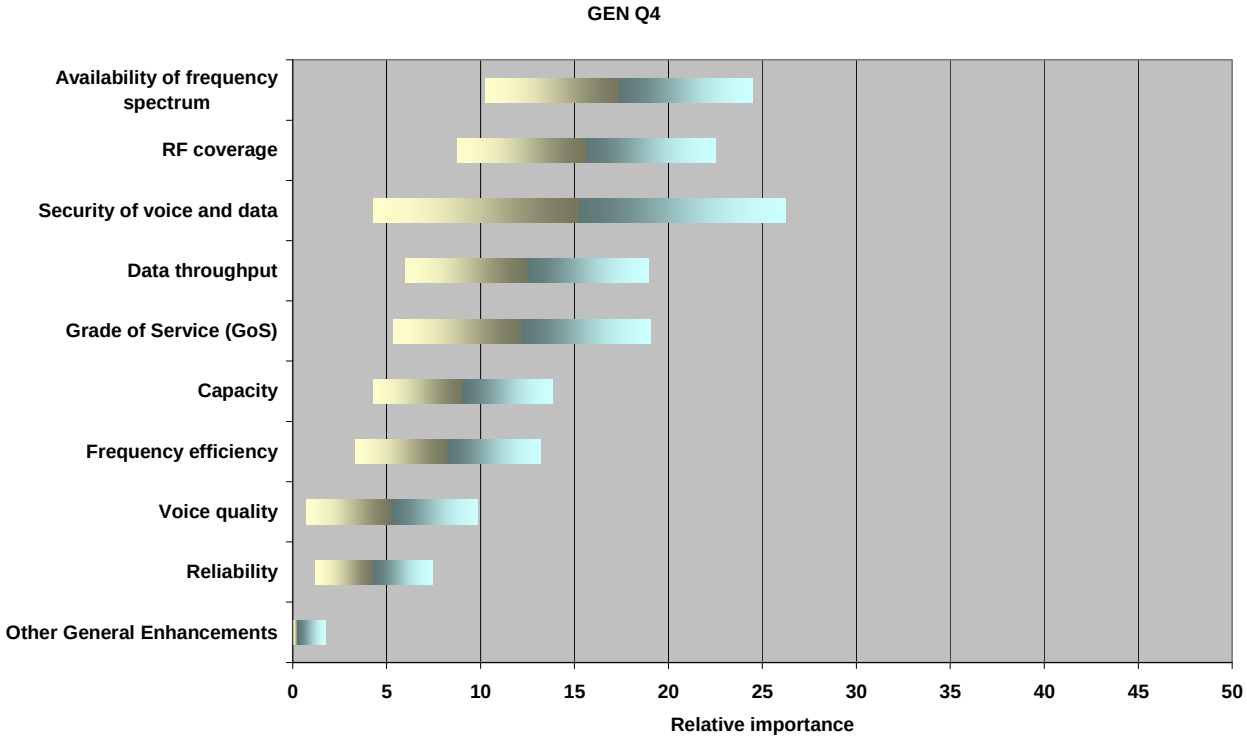

Figure 48

11.5 Weighted results All 5+ Experience respondents Industry area

Question 5 from questionnaire 2.

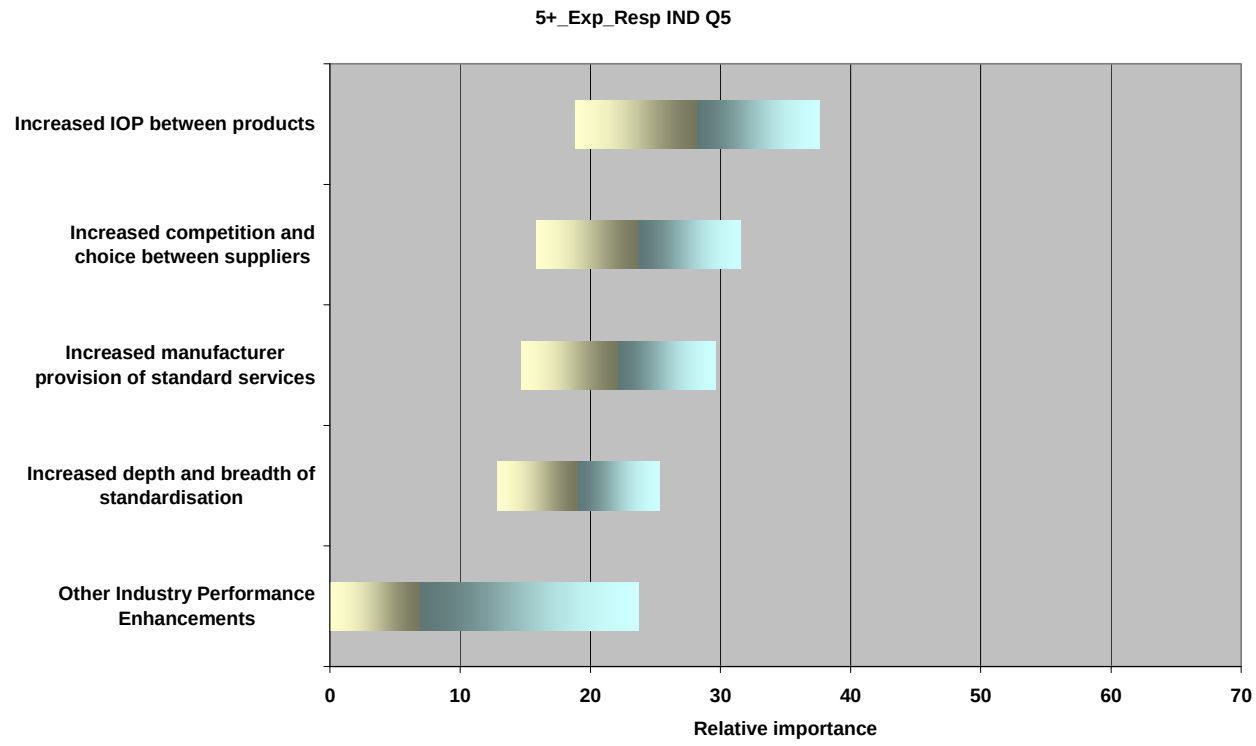

Figure 49

12 Weighted results All No Experience respondents by enhancement area

12.1 Weighted results All No Experience respondents TMO area

Question 1 from questionnaire 2.

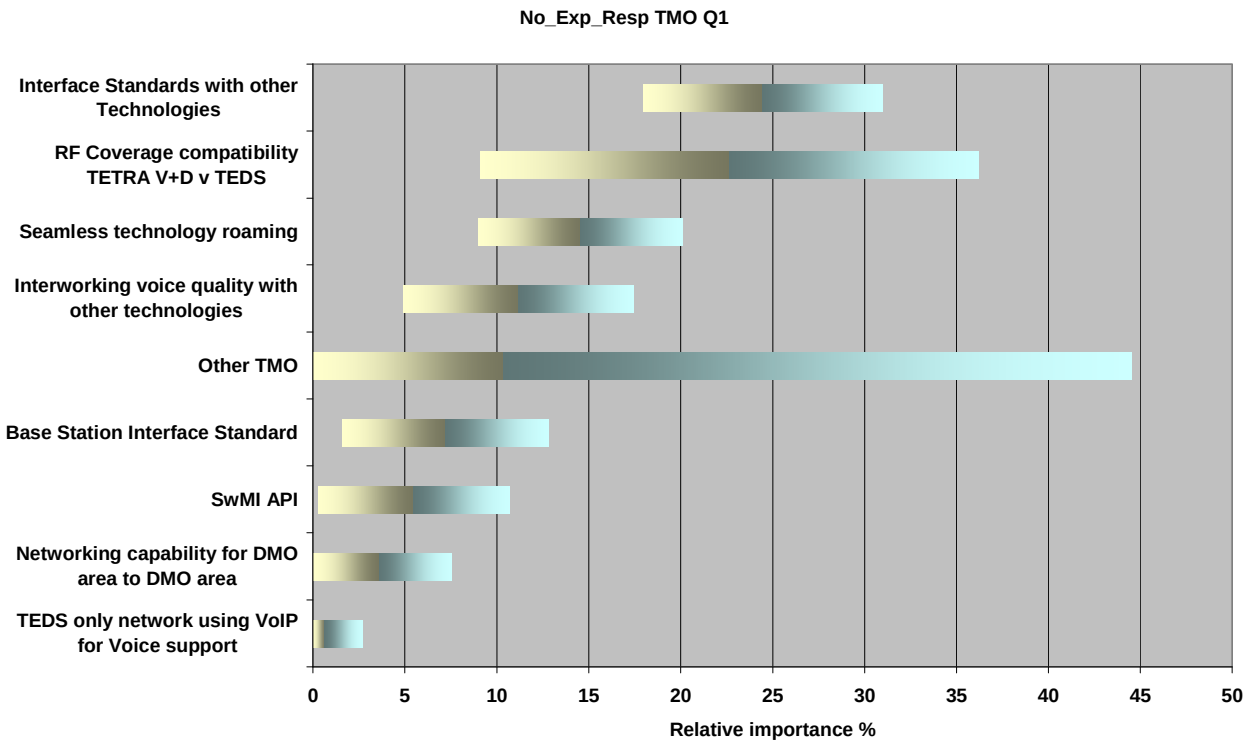

Figure 50

12.2 Weighted results All No Experience respondents DMO area

Question 2 from questionnaire 2.

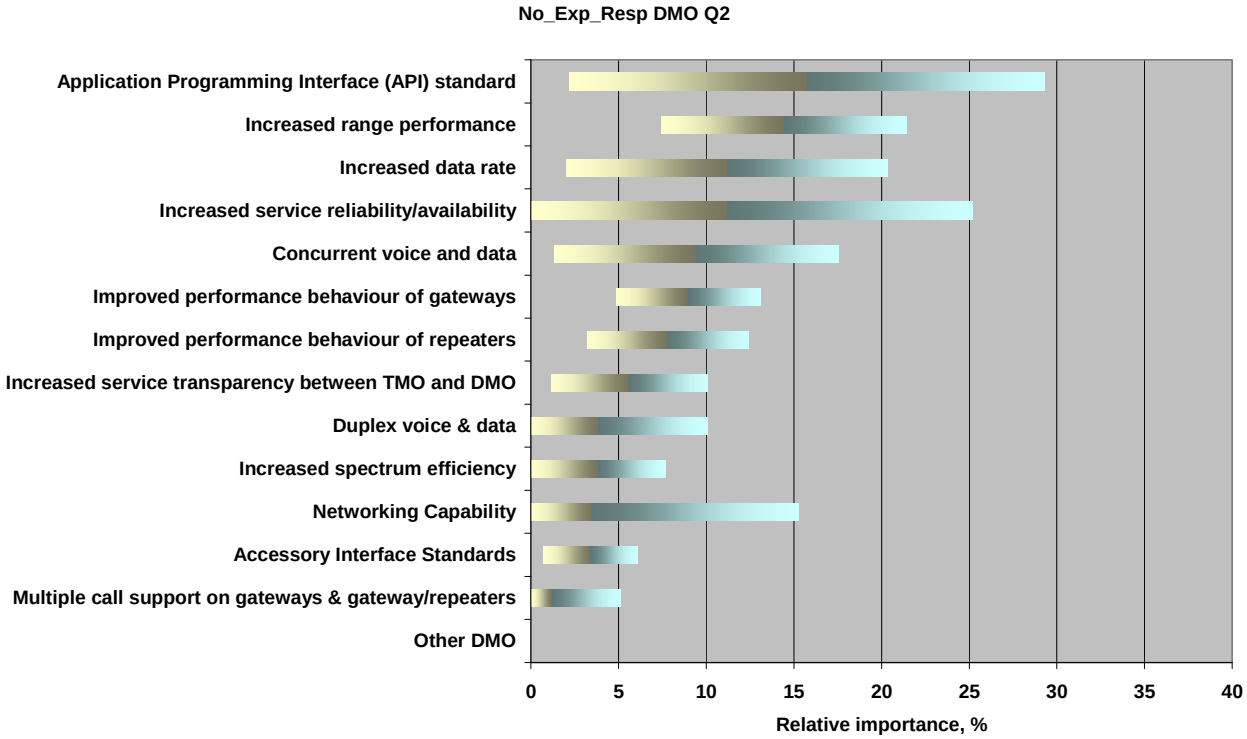

Figure 51

12.3 Weighted results All No Experience respondents Data area

Question 3 from questionnaire 2.

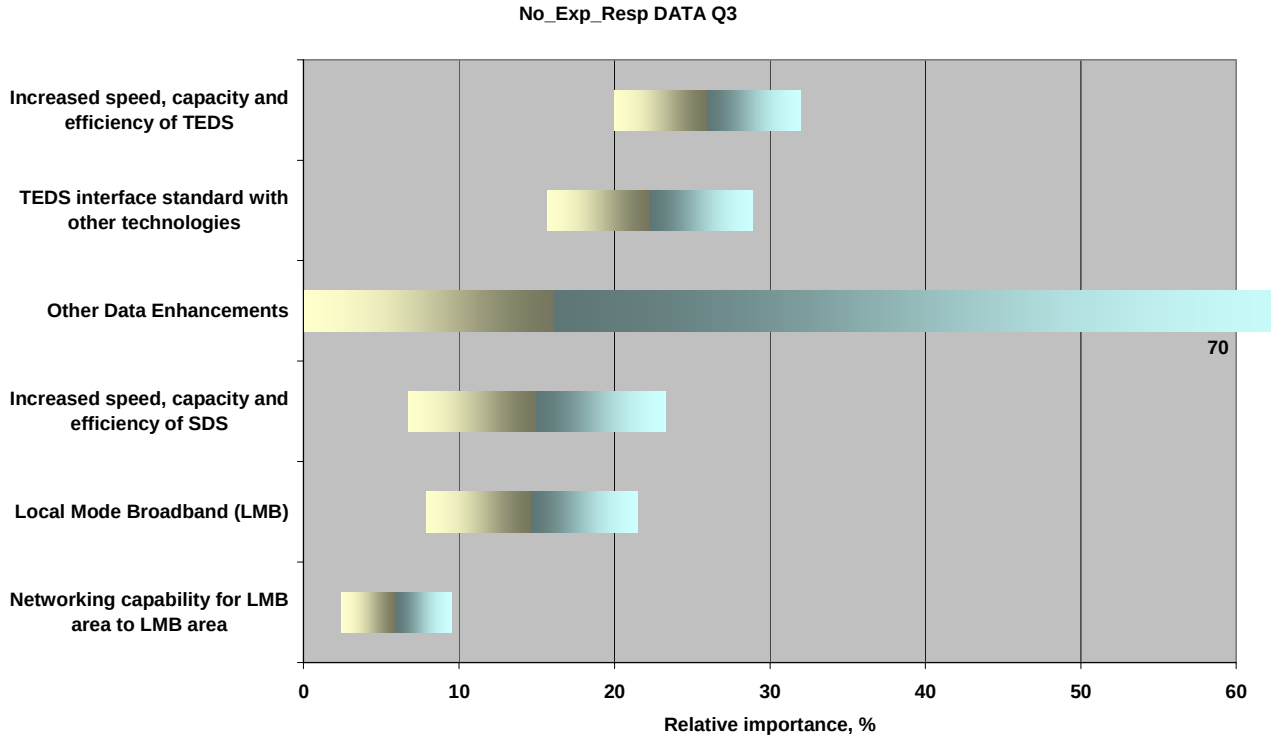

Figure 52

12.4 Weighted results All No Experience respondents General area

Question 4 from questionnaire 2.

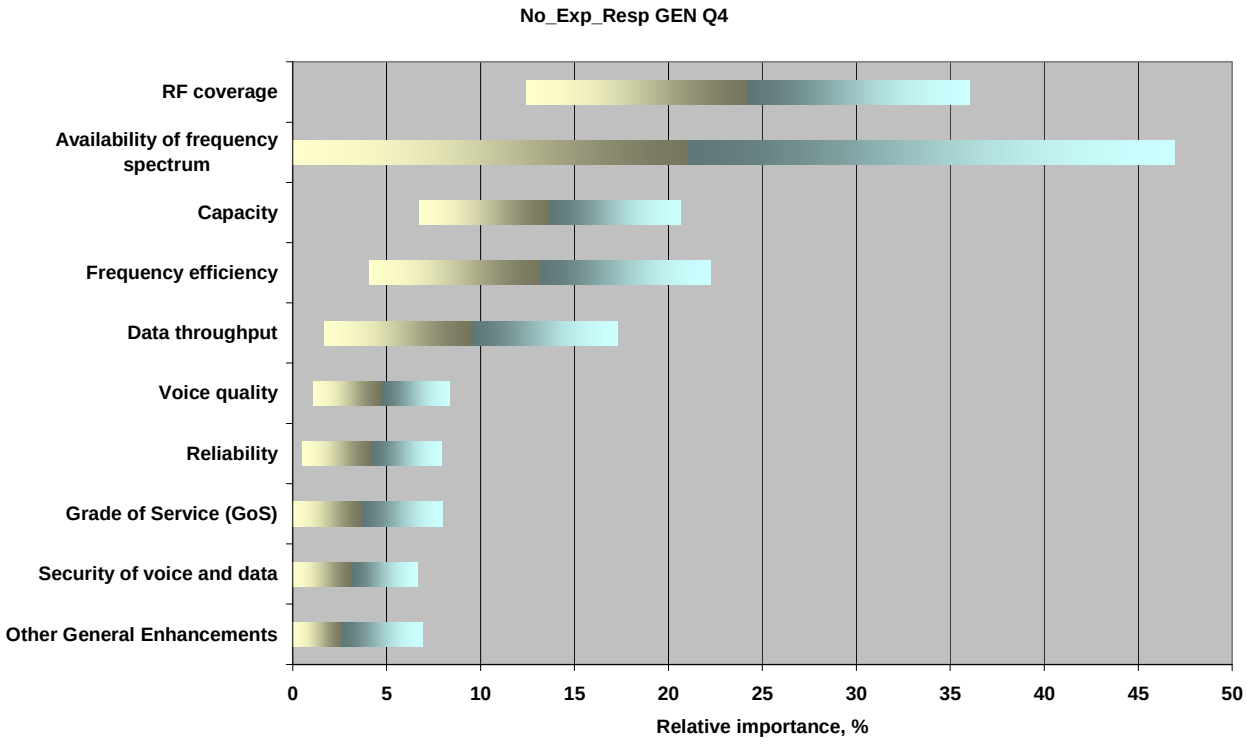

Figure 53

12.5 Weighted results All No Experience respondents Industry area

Question 5 from questionnaire 2

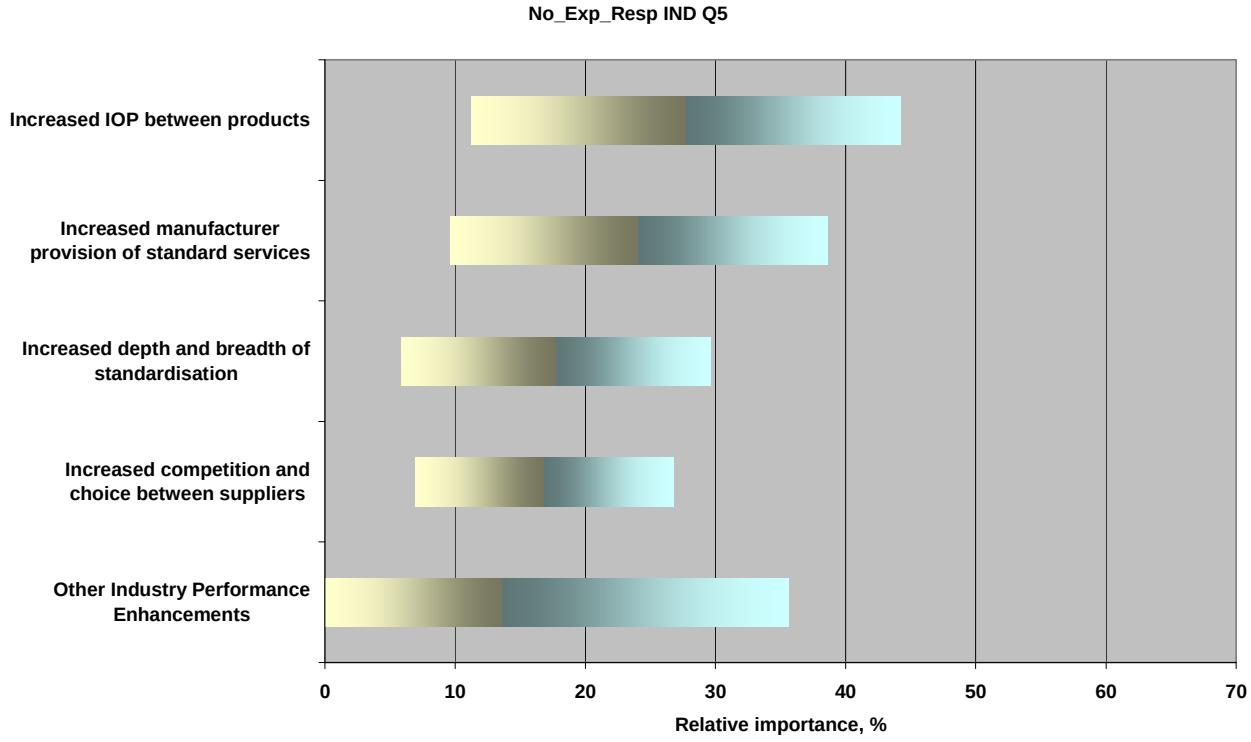

Figure 54

13 Weighted results All Public Safety and Security User 5+ Experience respondents by enhancement area

13.1 Weighted results All Public Safety and Security User 5+ Experience respondents TMO area

Question 1 from questionnaire 2.

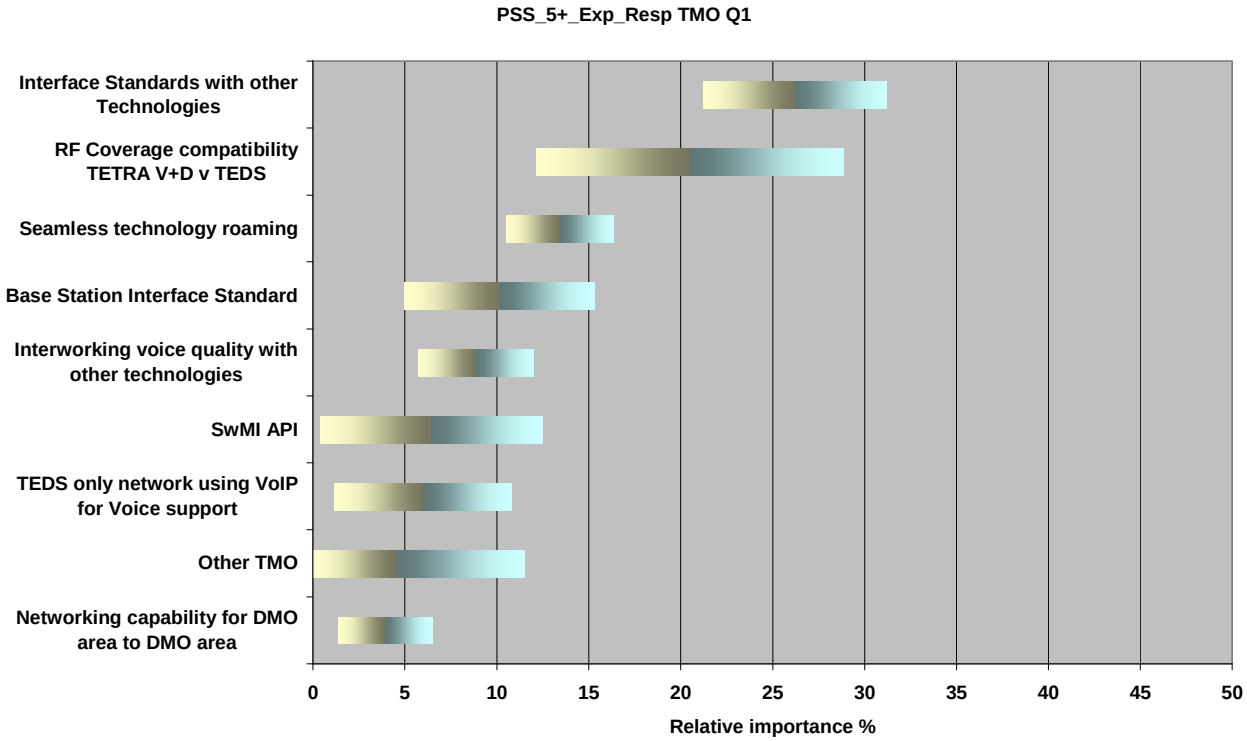

Figure 55

13.2 Weighted results All Public Safety and Security User 5+ Experience respondents DMO area

Question 2 from questionnaire 2.

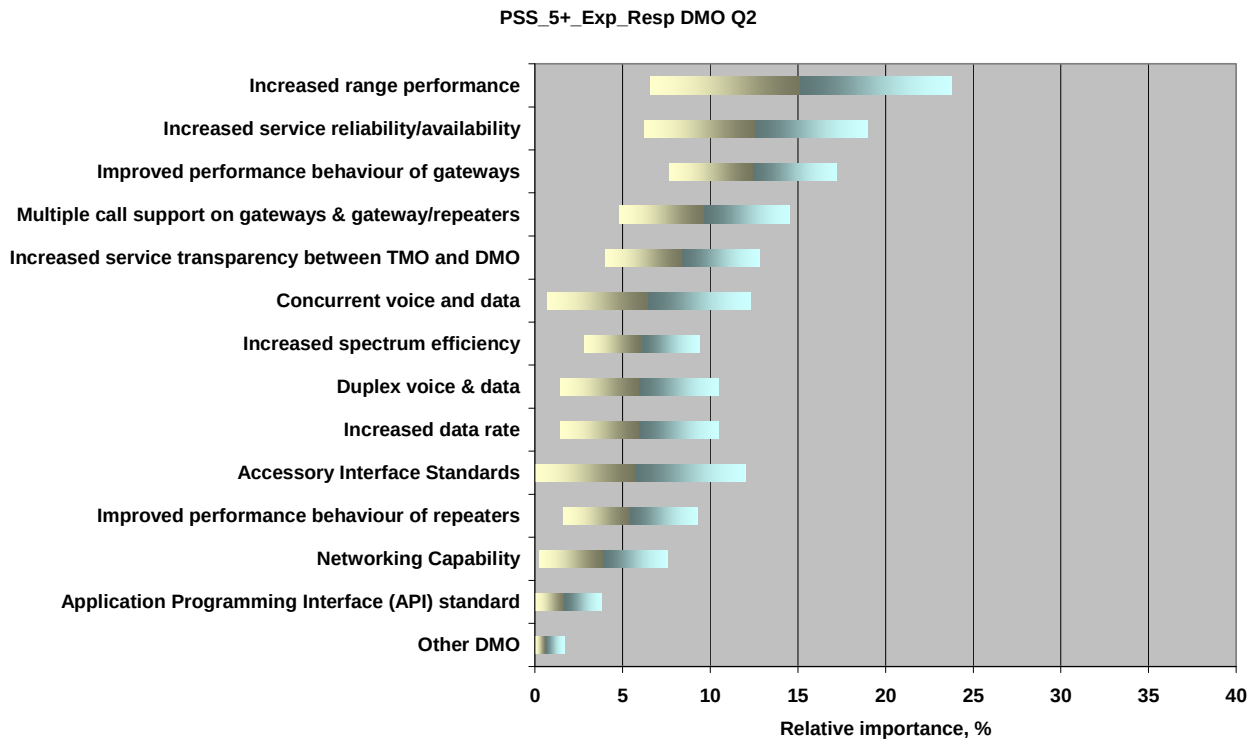

Figure 56

13.3 Weighted results All Public Safety and Security User 5+ Experience respondents Data area

Question 3 from questionnaire 2.

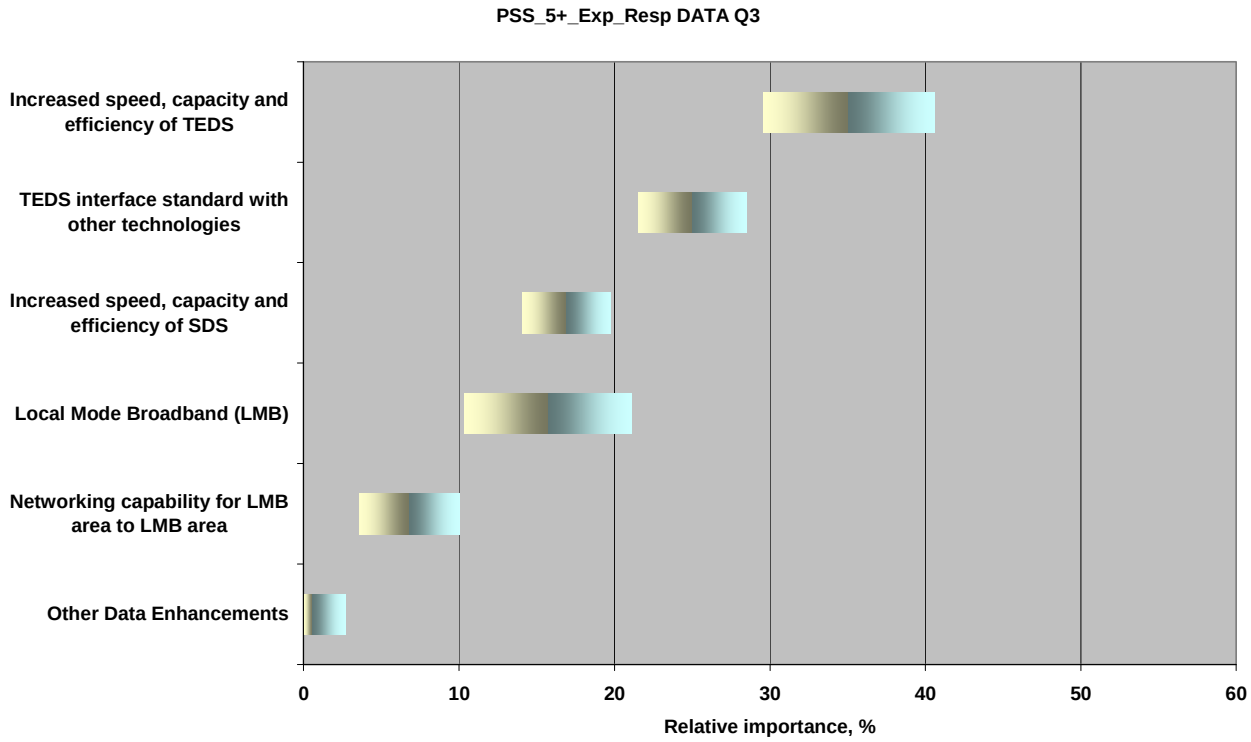

Figure 57

13.4 Weighted results All Public Safety and Security User 5+ Experience respondents General area

Question 4 from questionnaire 2.

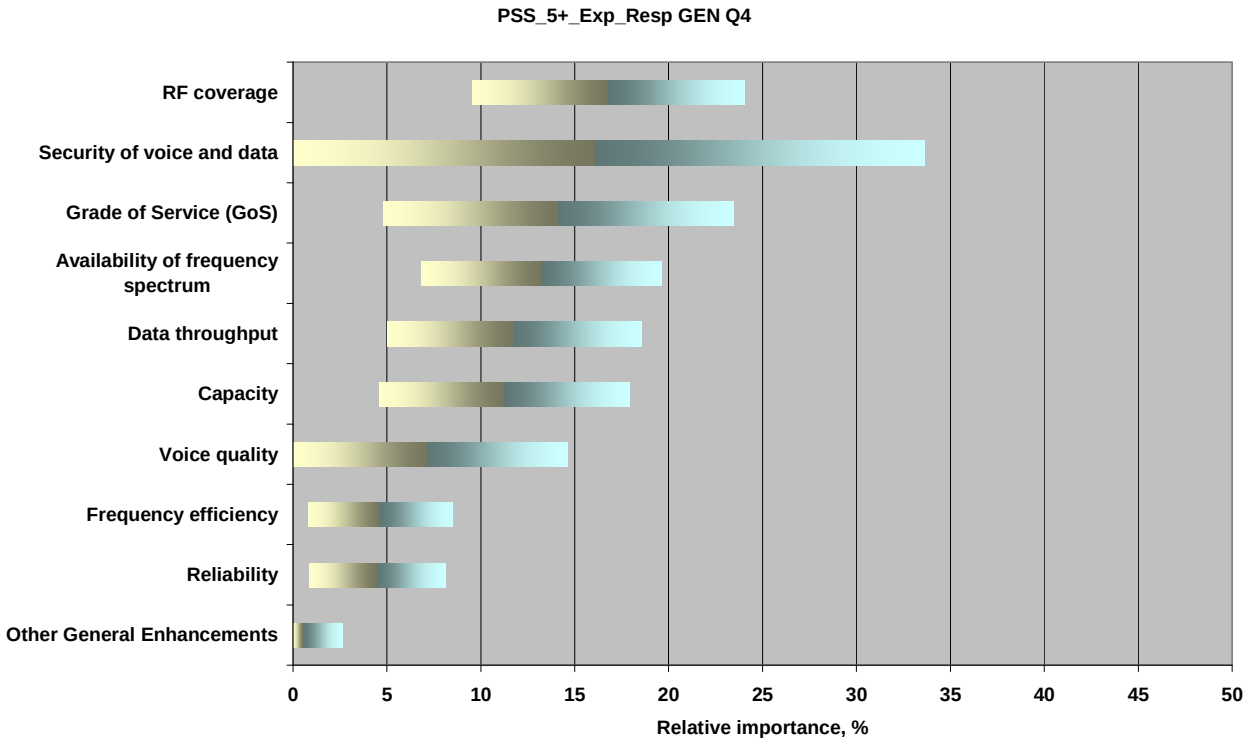

Figure 58

13.5 Weighted results All Public Safety and Security User 5+ Experience respondents Industry area

Question 5 from questionnaire 2.

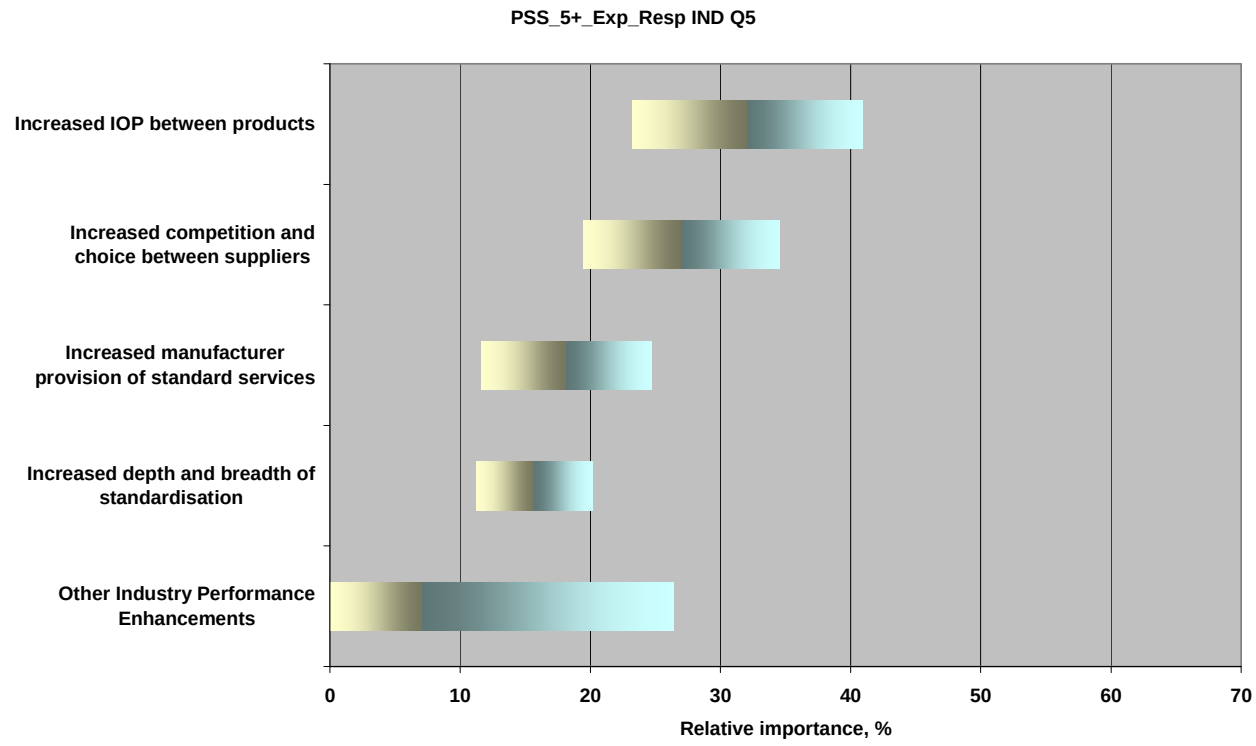

Figure 59

14 Weighted results Public Safety and Security User - Non Public Safety and Security User respondents comparison by enhancement area

14.1 Weighted results Public Safety and Security User - Non Public Safety and Security User respondents comparison TMO area

Question 1 from questionnaire 2.

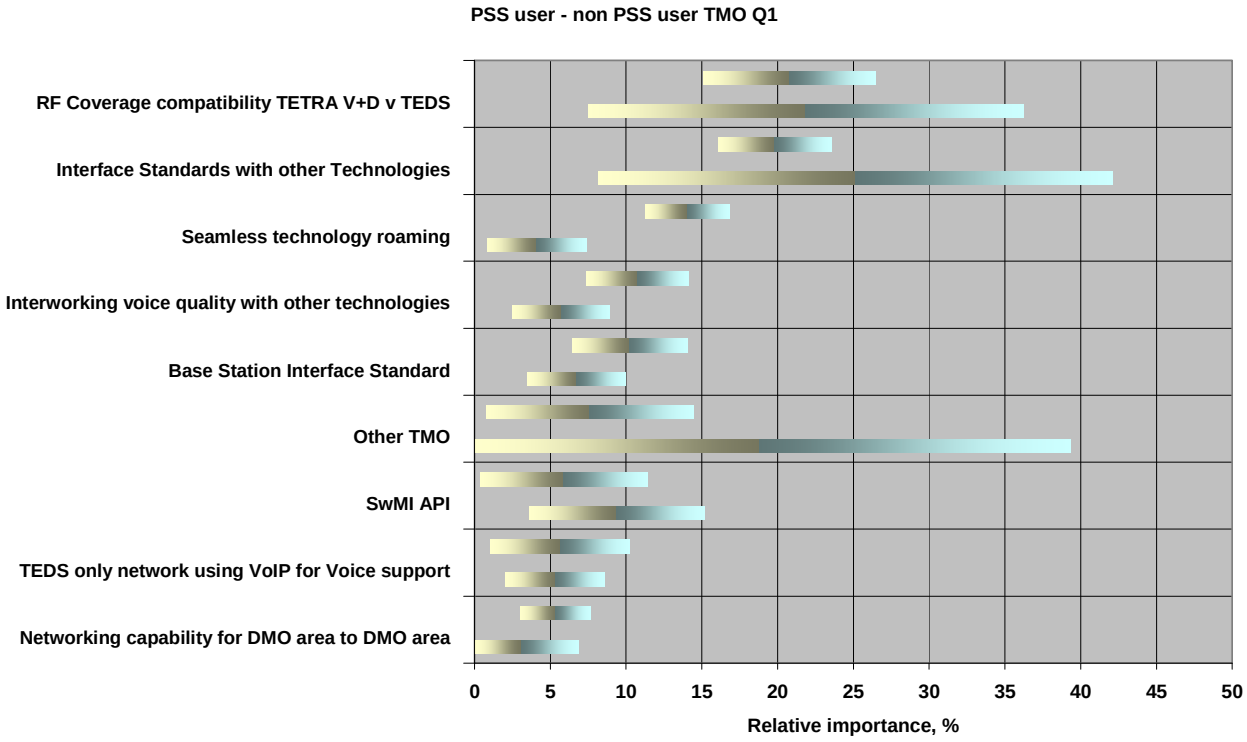

Figure 60

14.2 Weighted results Public Safety and Security User - Non Public Safety and Security User respondents comparison DMO area

Question 2 from questionnaire 2.

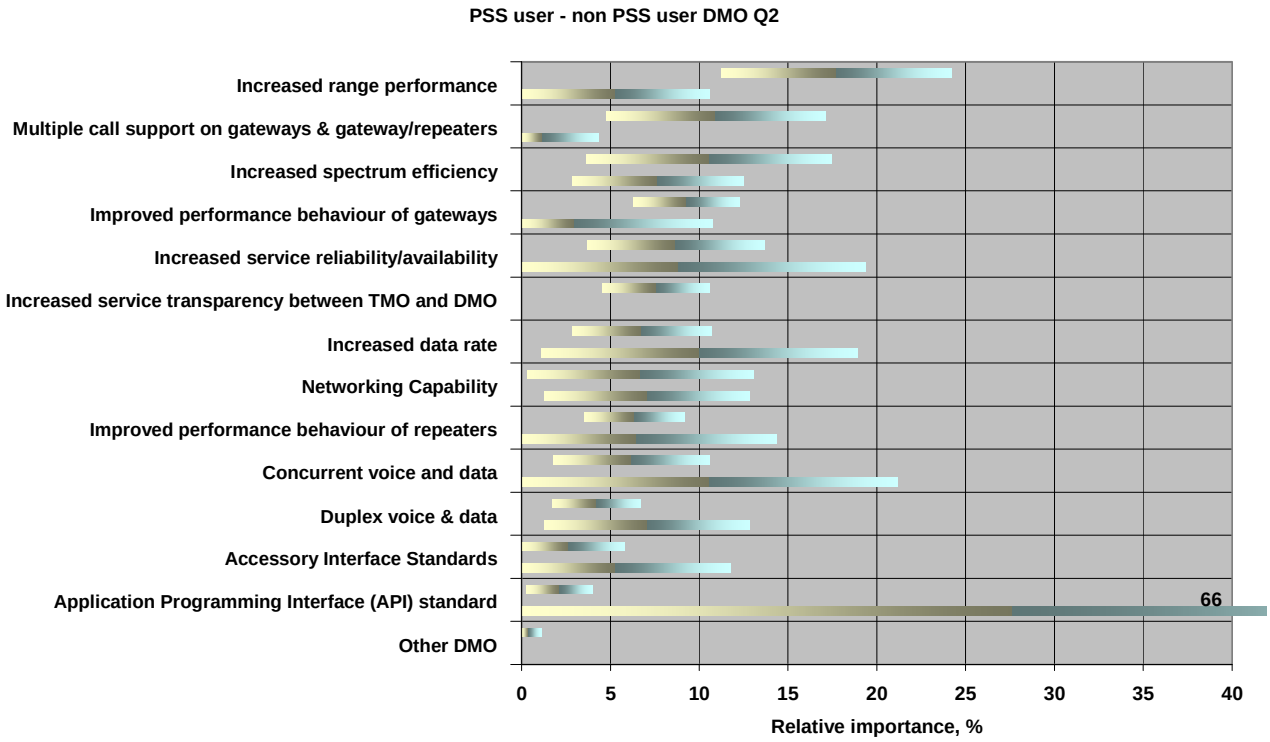

Figure 61

14.3 Weighted results Public Safety and Security User - Non Public Safety and Security User respondents comparison Data area

Question 3 from questionnaire 2.

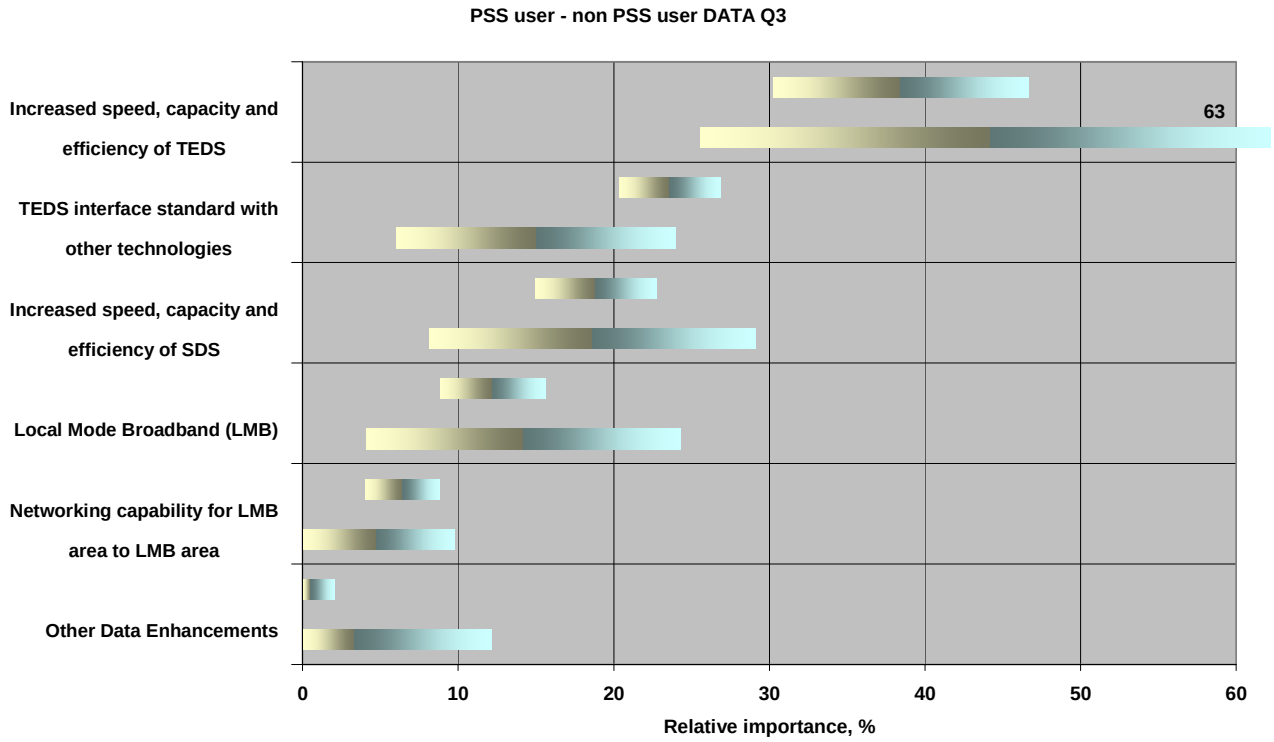

Figure 62

14.4 Weighted results Public Safety and Security User - Non Public Safety and Security User respondents comparison General area

Question 4 from questionnaire 2.

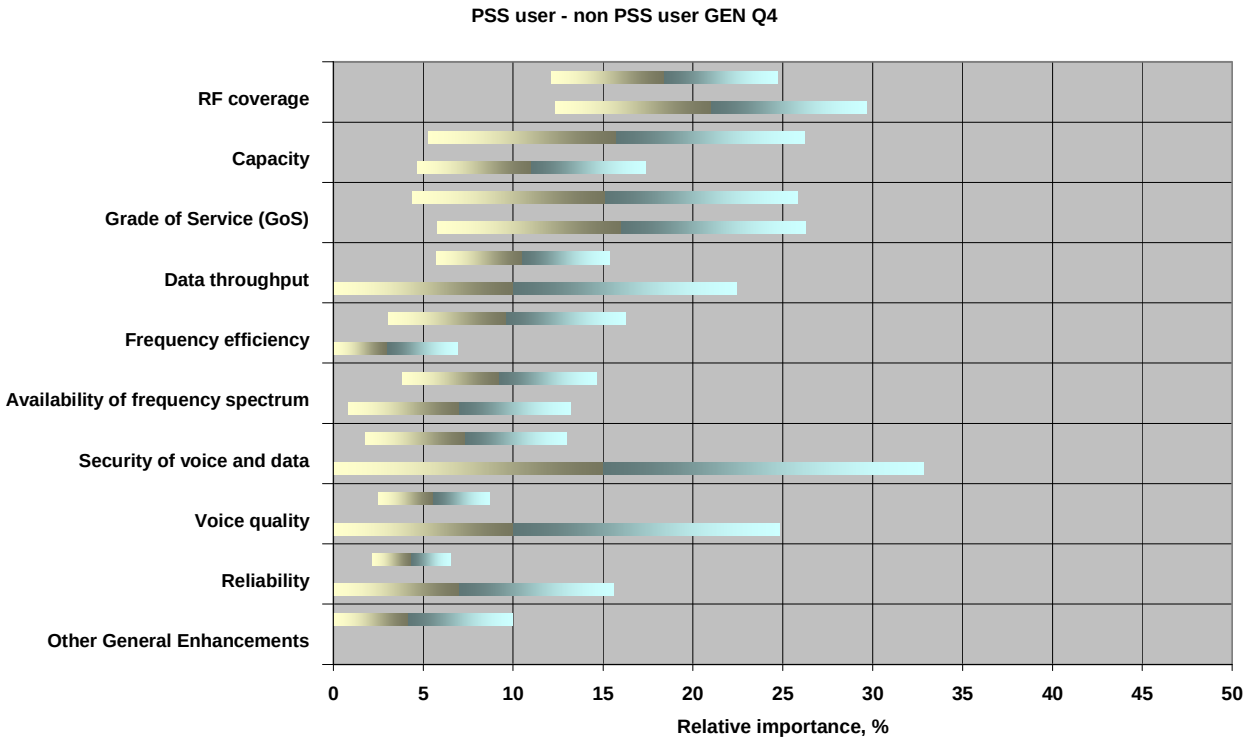

Figure 63

14.5 Weighted results Public Safety and Security User - Non Public Safety and Security User respondents comparison Industry area

Question 5 from questionnaire 2.

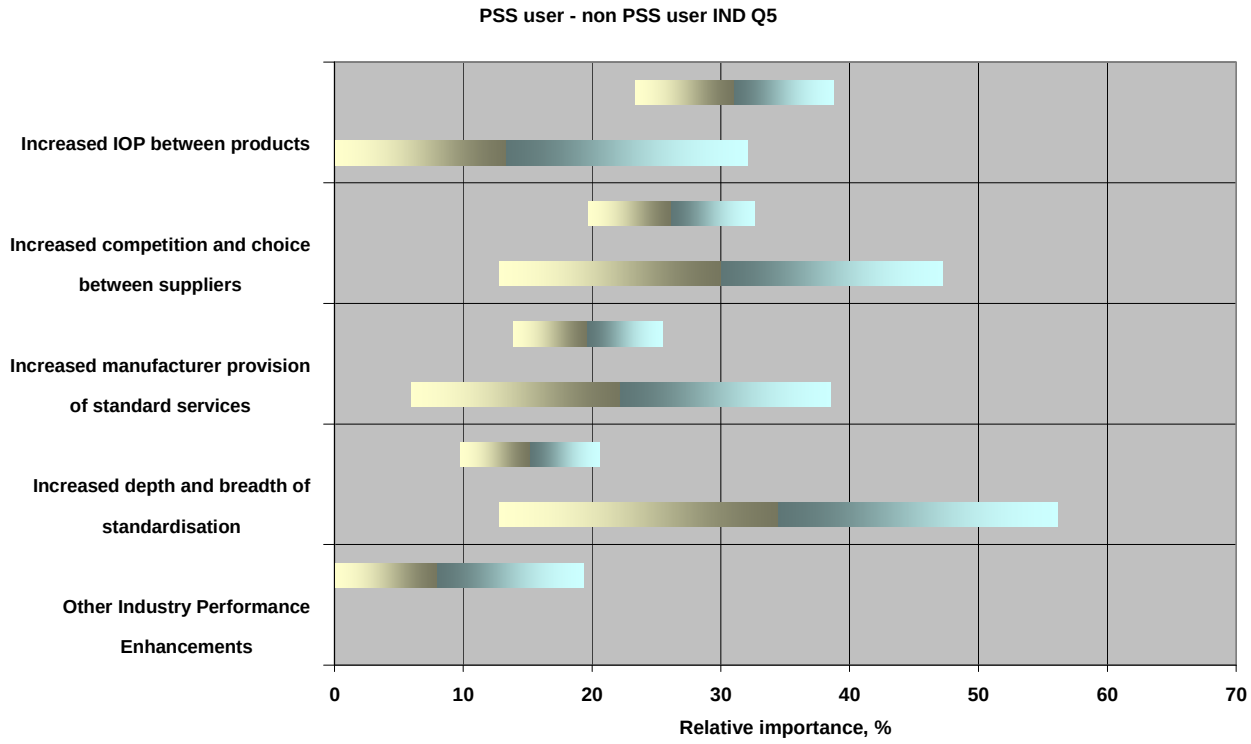

Figure 64

15 Weighted results Public Safety and Security User 5+ Experience - Manufacturer/supplier (5+ Experience) respondents comparison by enhancement area

15.1 Weighted results Public Safety and Security User 5+ Experience - Manufacturer/supplier (5+ Experience) respondents comparison TMO area

Question 1 from questionnaire 2.

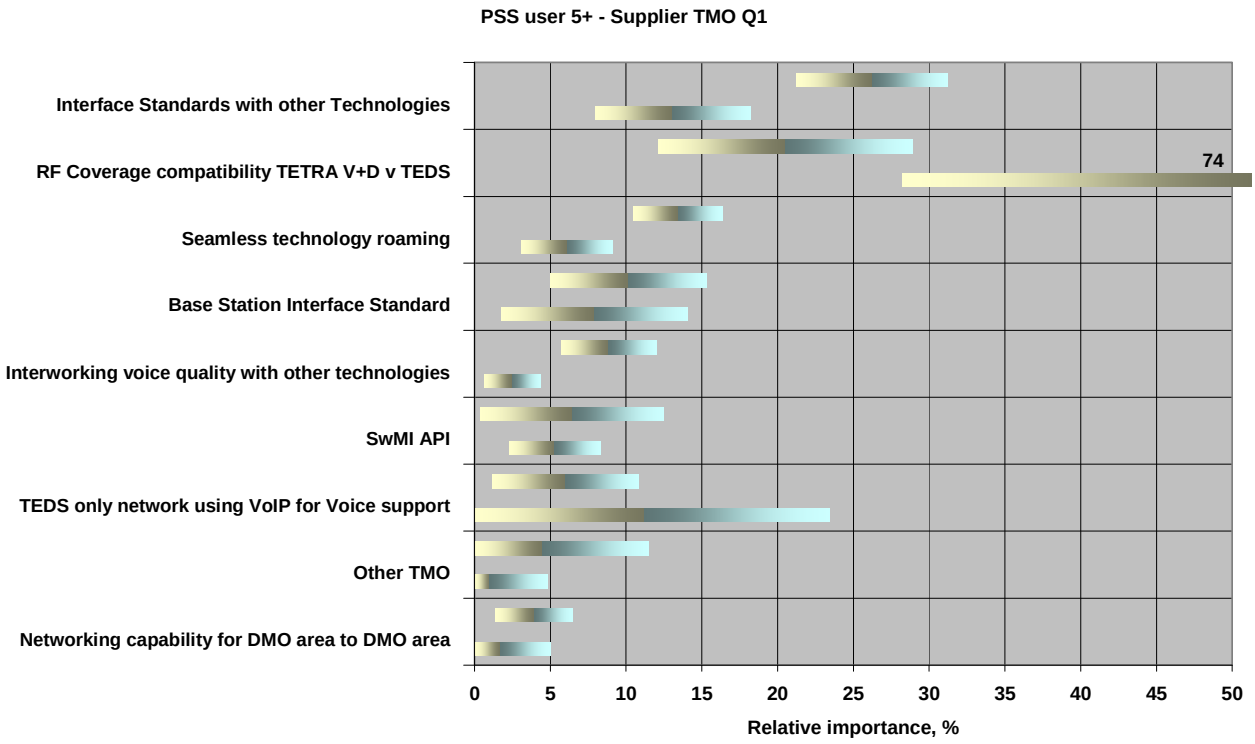

Figure 65

15.2 Weighted results Public Safety and Security User 5+ Experience - Manufacturer/supplier (5+ Experience) respondents comparison DMO area

Question 2 from questionnaire 2.

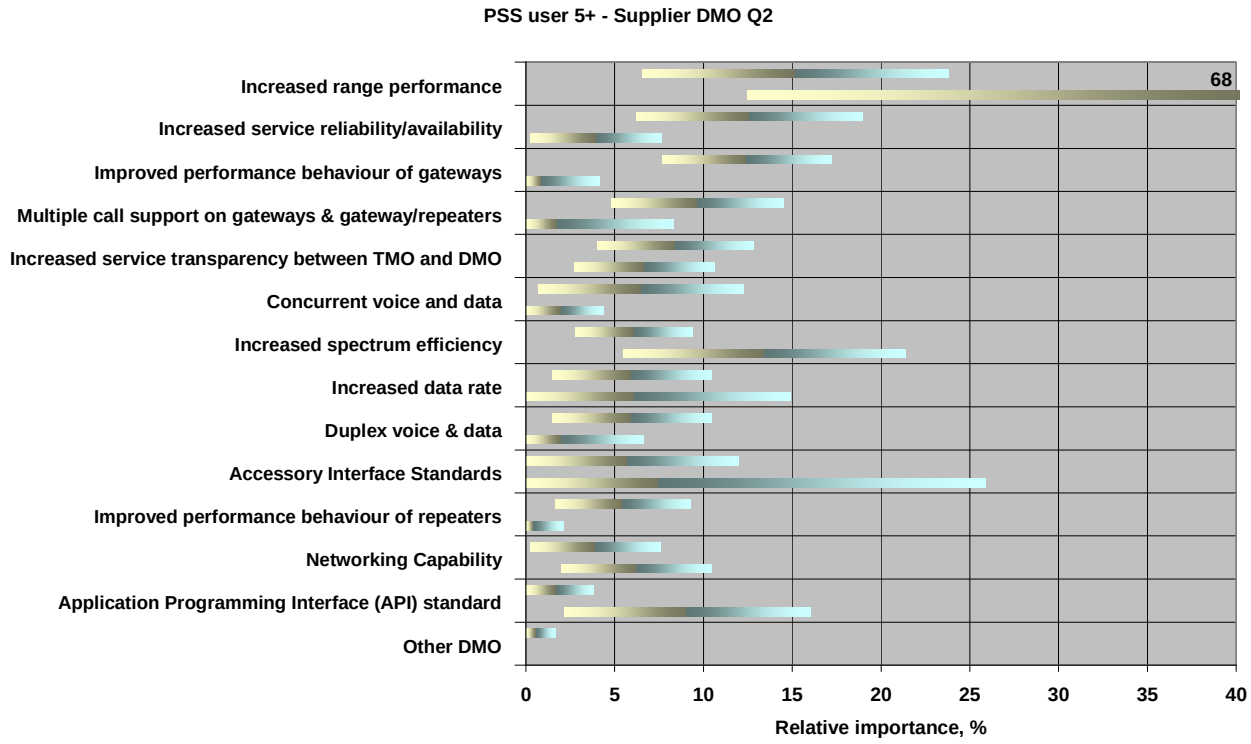

Figure 66

15.3 Weighted results Public Safety and Security User 5+ Experience - Manufacturer/supplier (5+ Experience) respondents comparison Data area

Question 3 from questionnaire 2.

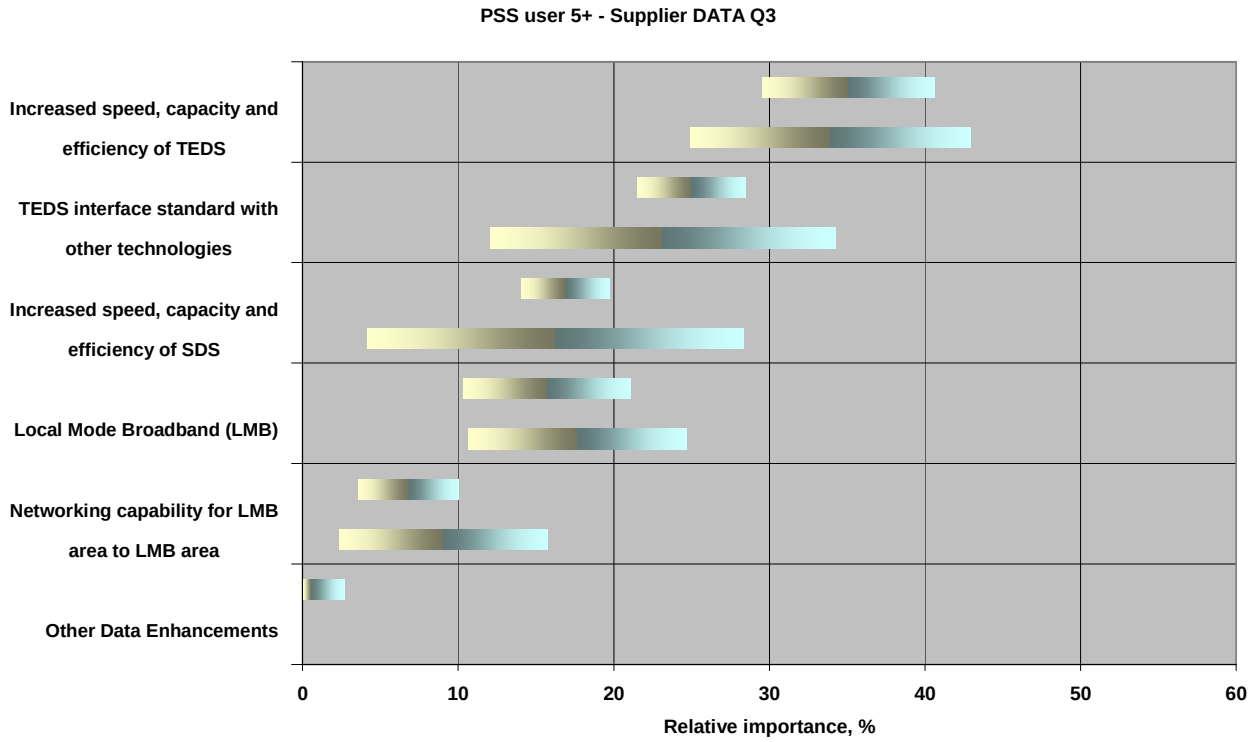

Figure 67

15.4 Weighted results Public Safety and Security User 5+ Experience - Manufacturer/supplier (5+ Experience) respondents comparison General area

Question 4 from questionnaire 2.

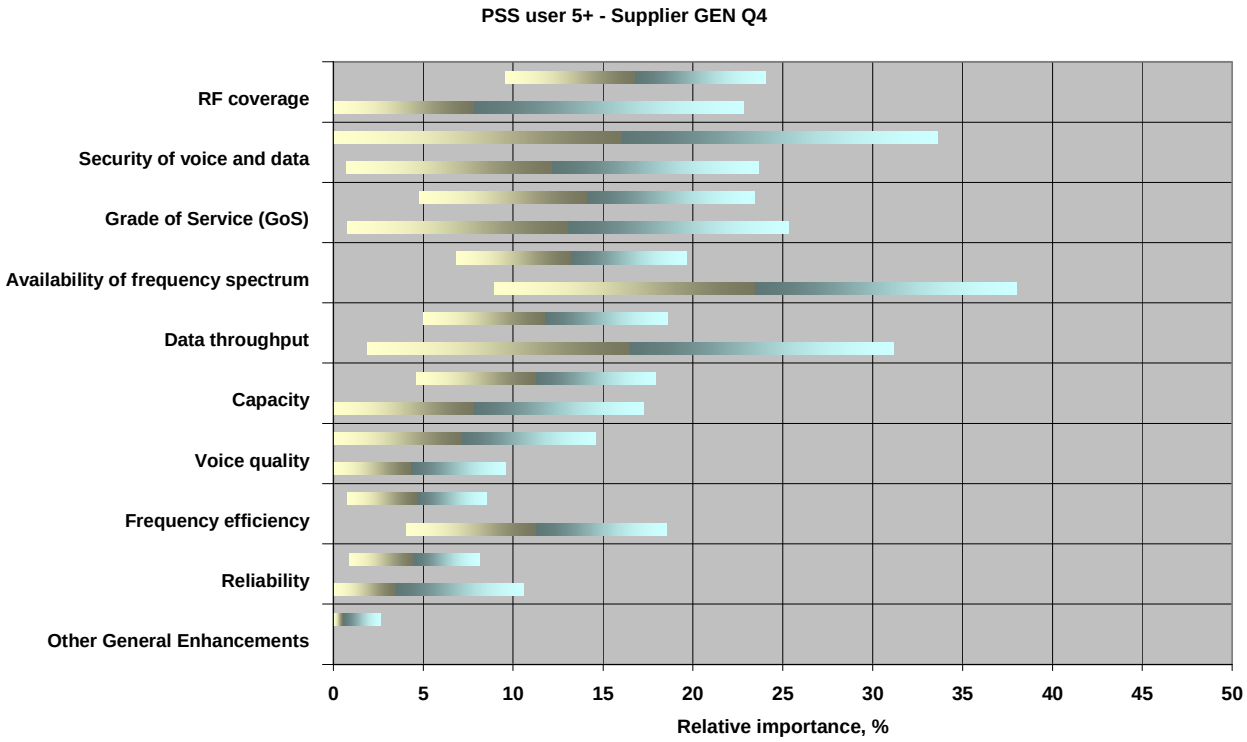

Figure 68

15.5 Weighted results Public Safety and Security User 5+ Experience - Manufacturer/supplier (5+ Experience) respondents comparison Industry area

Question 5 from questionnaire 2.

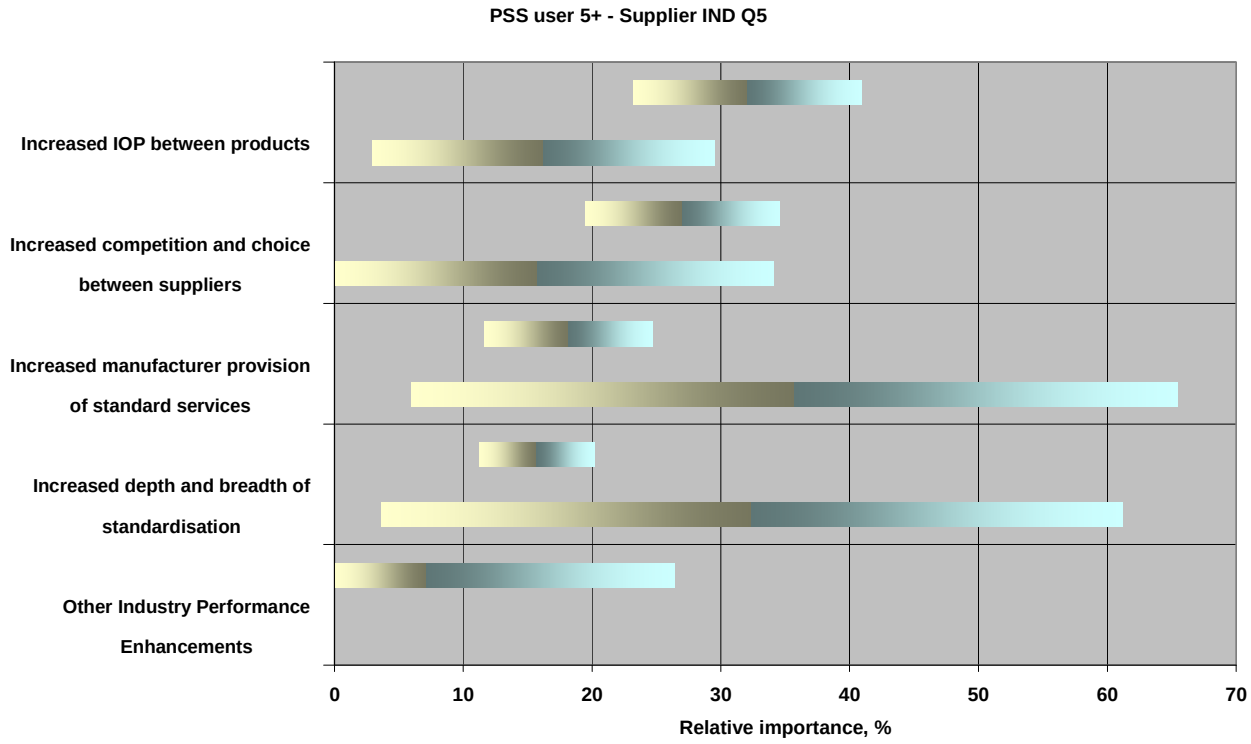

Figure 69

16 Weighted results 5+ Experience - No Experience respondents comparison by enhancement area

16.1 Weighted results 5+ Experience - No Experience respondents comparison TMO area

Question 1 from questionnaire 2.

Figure 70

16.2 Weighted results 5+ Experience - No Experience respondents comparison DMO area

Question 2 from questionnaire 2.

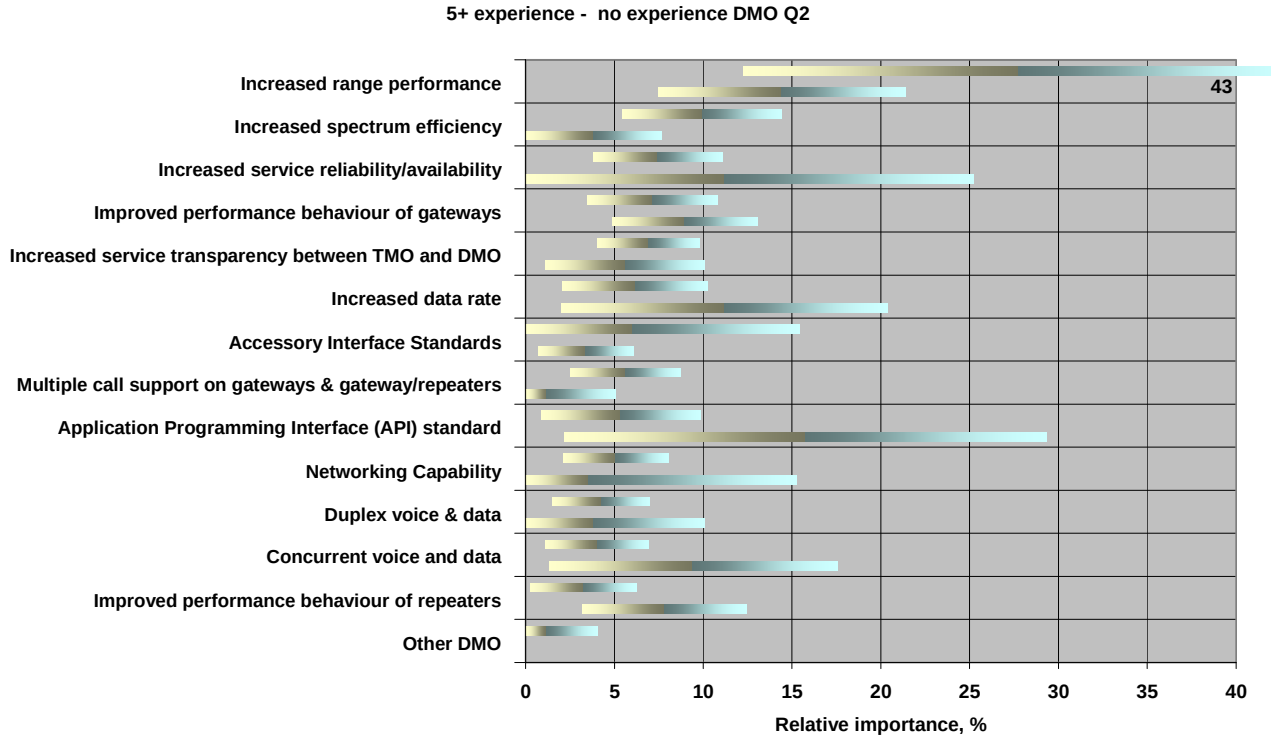

Figure 71

16.3 Weighted results 5+ Experience - No Experience respondents comparison Data area

Question 3 from questionnaire 2.

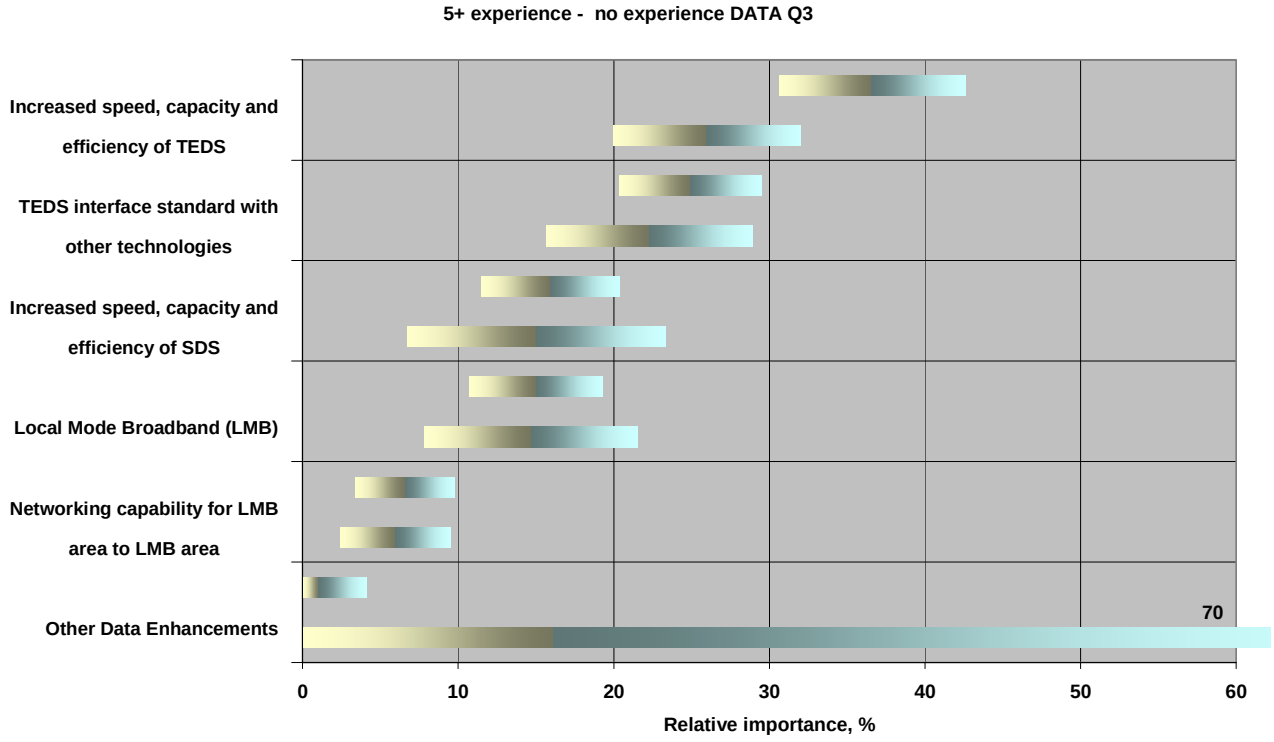

Figure 72

16.4 Weighted results 5+ Experience - No Experience respondents comparison General area

Question 4 from questionnaire 2.

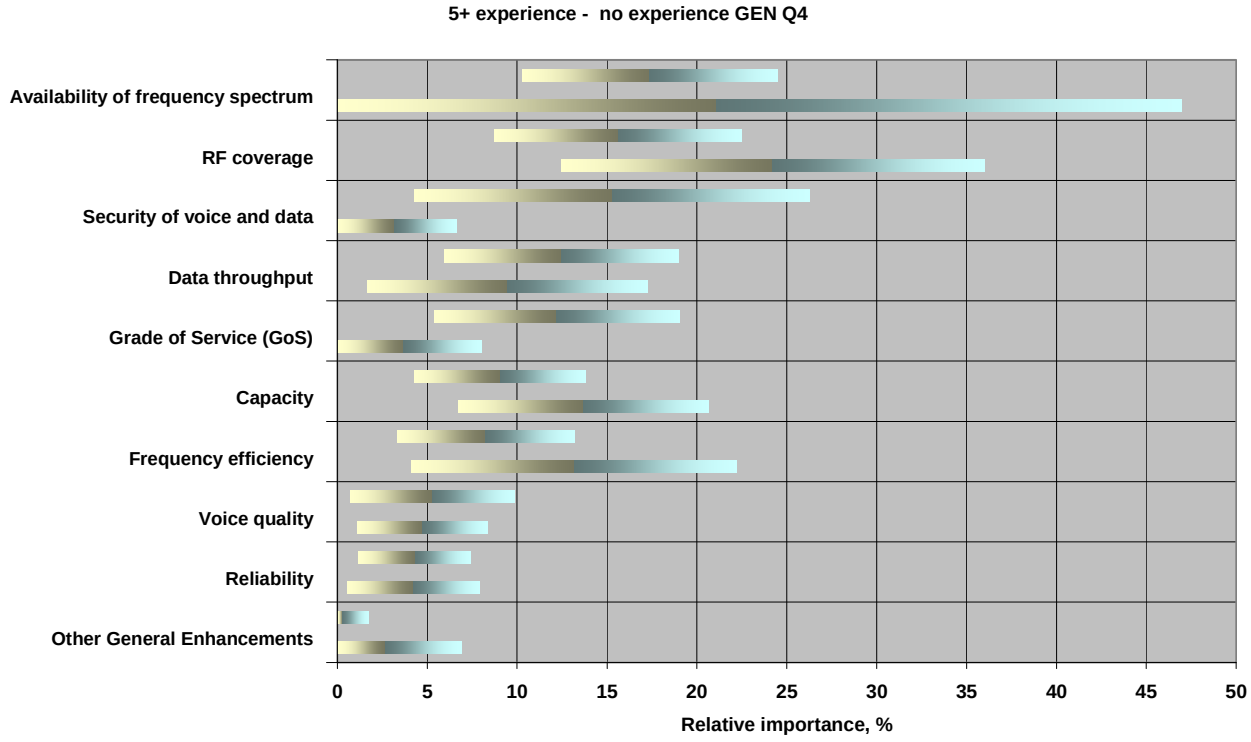

Figure 73

16.5 Weighted results 5+ Experience - No Experience respondents comparison Industry area

Question 5 from questionnaire 2.

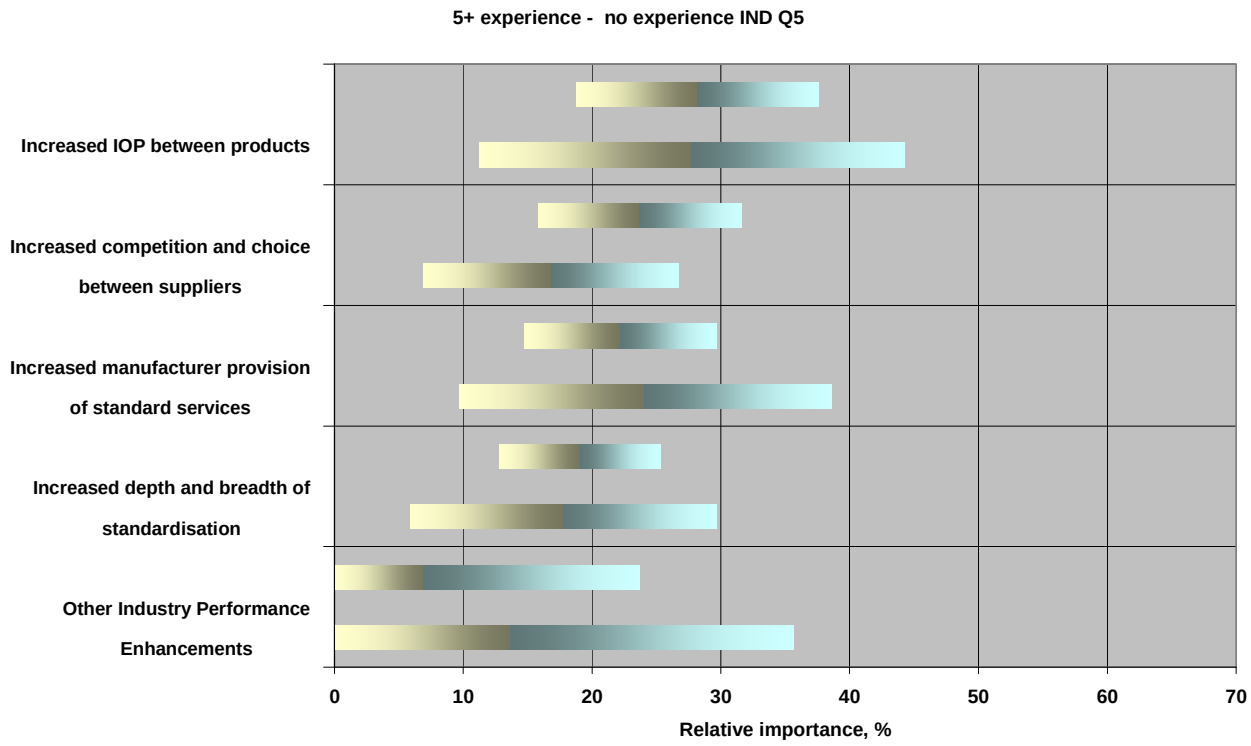

Figure 74

17 Conclusion

The present document should provide a clear indication of the weighting and relative importance for different market segments of the candidate TETRA enhancement areas identified and should enable TC TETRA to prioritise in the production of User Requirement Specifications (URSs) for use in TC TETRA to initiate new standardisation work by the technical Working Groups as required.

Annex A:
Future TETRA workshop questionnaire 1

FUTURE TETRA WORKSHOP QUESTIONNAIRE 1

Respondent Profile

Please indicate your affiliation by ticking **only one** of the boxes below that best matches your organisation/business

If your affiliation is not listed please write it in the space provided in the "other" box and tick the box accordingly

User Organisation		**TETRA Manufacturer/Supplier**		**Other Organisation**	
Public Safety		Infrastructure		Administrator	
Public Safety Operator		Terminals		Regulator	
PAMR Operator		Infrastructure & Terminals		Consultancy	
Private Operator		Applications		Other	
Government		Other		Other	
Transportation		Other		Other	
Utility					
Industrial		Comments			
Military					
Other					
Other					

Respondent Number: **Note:** Assigned at start of workshop to ensure continuity with Questionnaire 2.

Question 1

Is your organisation an existing user of TETRA or a supplier of TETRA products?

Yes	
No	

Question 2 (do not answer if not a existing TETRA user or supplier)

How long as your organisation been an existing user of TETRA or a supplier of TETRA products (please tick appropriate box)?

Less than 1 year		**2 to 3 years**		**4 to 5 years**	
1 to 2 years		**3 to 4 years**		**Greater than 5 years**	

Question 3

You have been provided with an imaginary 100 units of currency, which you are required to spend as you feel appropriate across the 6 possible enhancement areas below. You may spend your money on one area or across all 6 areas. You must spend all your mon

NOTE: If you wish to spend your money on another category not listed, please enter this category in the "other" box and provide a brief description in the "additional comments" box below.

	Spend	
Trunked Mode Operation(TMO)		**Additional Comments**
Direct Mode Operation (DMO)		
Short Data Service (SDS)		
Packet Data Service		
High Speed Data (HSD)		
Security		
Other		
Other		
Other		
Total	**100**	

THANK YOU FOR YOUR PARTICIPATION

Annex B:
Future TETRA workshop questionnaire 2

FUTURE TETRA WORKSHOP QUESTIONNAIRE 2

Respondent Number: [ ] **Note:** Must be the same number as that entered on Questionnaire 1.

Workshop Group
Name of ETSI TC TETRA person facilitating the group: [ ]

Note

You have been provided with an imaginary 600 units of currency, which you are required to spend 100 units across each of the possible enhancement areas listed under each of the 6 category questions below. You may spend your money on one area or across all enhancement areas in each of the 6 category areas. You must spend all your money so that the total adds up to 100 units for each category, making a total spend of 600 units (100 x 6).

Question 1

TMO Network Enhancements	**Spend**
RF Coverage compatibility TETRA V+D v TEDS	
SwMI API	
Base Station Interface Standard	
Interface Standards with other Technologies	
TEDS only network using VoIP for Voice support	
Networking capability for DMO area to DMO area	
Seamless technology roaming	
Interworking voice quality with other technologies	
Call out	
Other	
Other	
Other	
Other	
Other	
Total	**100**

Question 2

DMO Enhancements	**Spend**
Increased spectrum efficiency	
Increased service reliability/availability	
Increased range performance	
Increased data rate	
Duplex voice & data	
Concurrent voice and data	
Increased service transparency between TMO and DMO	
Improved performance behaviour of gateways	
Improved performance behaviour of repeaters	
Multiple call support on gateways & gateway/repeaters	
Application Programming Interface (API) standard	
Accessory Interface Standards	
Networking Capability	
Other	
Total	**100**

Question 3

Data Enhancements	**Spend**
Increased speed, capacity and efficiency of TEDS	
TEDS interface standard with other technologies	
Increased speed, capacity and efficiency of SDS	
Local Mode Broadband (LMB)	
Networking capability for LMB area to LMB area	
Other	
Other	
Other	
Other	
Other	
Total	**100**

Question 4

General Enhancement Areas	**Spend**
RF coverage	
Capacity	
Grade of Service (GoS)	
Frequency efficiency	
Reliability	
Voice quality	
Data throughput	
Security of voice and data	
Availability of frequency spectrum	
Other	
Total	**100**

Question 5

Industry Performance Enhancements	**Spend**
Increased depth and breadth of standardisation	
Increased manufacturer provision of standard services	
Increased IOP between products	
Increased competition and choice between suppliers	
Other	
Other	
Other	
Total	**100**

Question 6

Relative Importance of Enhancement Groups	**Spend**
TMO Network Enhancements	
DMO Enhancements	
Data Enhancements	
General Enhancement Areas	
Industry Performance Enhancements	
Total	**100**

Additional Comments

THANK YOU FOR YOUR PARTICIPATION

Annex C:
Candidate TETRA enhancement areas

C.1 Introduction

From a variety of industry meetings, seminars and workshops that have occurred over the last two years, several candidate TETRA enhancement areas have been identified. Some of these enhancement areas have resulted from actual field experiences by users and some by the promise of new services and capabilities to be made available on new and evolving technologies.

To understand in greater detail the relative importance of the candidate TETRA enhancement areas that may require standardization work by ETSI TC TETRA, the following category groupings have been used:

- Trunked Mode Operation (TMO) Network Enhancements.
- Direct Mode Operation (DMO) Enhancement.
- Data Enhancements.

Also, to help understand the relative importance of other factors that could be used to reinforce the need for standardization work by ETSI TC TETRA in certain enhancement areas, two further category groupings have been used:

- General Enhancement Areas.
- Industry Performance Enhancements.

As all these candidate enhancement areas will be the subject matter of the Future of TETRA Workshop, a description of each area has been provided in advance of the workshop to ensure a common understanding when discussing, ranking and rating each of the areas during the workshop.

C.2 TMO network enhancements

TMO is the primary mode of operation in a land based TETRA network and as such it has been designed to provide the highest level of performance in terms of RF coverage, Capacity/Grade of Service (GoS) and reliability/availability as well as the provision of PMR, Data and Telephony services and facilities.

This said, some previously requested requirements and new requirements have been mentioned as particular enhancement areas. Therefore, identifying the relative importance of the TMO enhancement areas described below should help establish the importance and timeliness of any standardisation work in the respective enhancement areas.

C.2.1 RF coverage compatibility between TETRA V+D and TEDS

The RF coverage footprint of TETRA V+D and TEDS, when using the same base station sites, is to be approximately the same to ensure compatibility.

C.2.2 SwMI and Terminal API

An open and standardised Application Programming Interface into the TETRA network and TETRA Terminals to enable an open market for applications connecting to the TETRA network (e.g. control centres, network management systems, etc.).

C.2.3 Base Station interface standard

An open and standardised base station interface enabling an open market for base stations (from different manufacturers) connecting to the TETRA network.

C.2.4 Interface standards with other technologies

There are a number of interface standards with other technologies that have been mentioned in the TETRA community, for example, the need to standardise on reliable and advanced application protocols and mechanisms to support multimedia application developments using TETRA and TEDS data services.

Also, mention has been made to standardise DMO gateways so that the IP data services & Internet connectivity of TMO networks are transparent to DMO areas. In the past, mention has also been made to standardise interfaces with GSM/GPRS/UMTS and other PMR technologies for interoperability purposes.

C.2.5 TEDS only Network using VoIP for voice communications

IP only TETRA TEDS network offering all TETRA (V+D) services on TEDS, including voice.

C.2.6 Networking capability for DMO area to DMO area

A networking capability used to increase DMO area coverage by interconnecting (networking) different DMO areas. For example, one possible solution could be a type of ad-hoc networking between DMO capable devices.

C.2.7 Seamless technology roaming

Multi-Mode/Multi-technology (TETRA + GSM and/or UMTS and/or WiFi and/or WiMAX etc) radios providing uniform TETRA service functionality independent of the radio mode.

C.2.8 Increased voice quality when interworking with other technologies

Increasing voice quality of end-to-end communications when interworking with other technologies like GSM, VoIP. For example, the voice communication quality resulting from the need to use transcoding (e.g. TETRA-GSM, TETRA-VoIP) where narrowband Codecs are used (like current TETRA Codec) tends to be low.

C.3 DMO Enhancements

It is well recognised that the RF Coverage, Capacity/ GoS and Reliability/Availability performance requirements of a TETRA TMO network are often "traded-off" in the interest of economics by using DMO to provide additional RF coverage, Capacity and Reliability. This means that the services and facilities provided in DMO ideally need to match those provided in TMO, for example, as seamless as possible operation between TMO and DMO.

The following candidate DMO enhancement areas are mainly aimed at achieving this ideal and therefore, identifying the relative importance of the DMO enhancement areas described below should help establish the importance and timeliness of any resulting standardization work in the respective enhancement areas.

Because of the way in which DMO "time slot" signalling operates, the ability to provide all the candidate enhancements areas listed below, with the exception of the API, accessory interface standard and networking capability, may require new DMO signalling methods and protocols to be considered.

C.3.1 Increased frequency efficiency

Some users have expressed a need to increase the number of independent DMO channels within the limited frequency spectrum available.

C.3.2 Increased call service reliability/availability

Some users in particular DMO communication scenarios have experienced difficulties in setting up long range DMO calls.

C.3.3 Increased data rate

Requirement for DMO Data rates matching those already available on TMO.

C.3.4 Duplex voice

Full duplex DMO voice communications as provided on TMO

C.3.5 Concurrent voice and data

Even though available in the TETRA V+D standard (though not yet provided by suppliers) a requirement for "concurrent voice and data" in DMO has also been requested.

C.3.6 Increased service transparency between TMO and DMO to allow seamless operation

Requirements have been mentioned for increased service transparency between TMO and DMO in, for example, the following areas,

- Automatic channel assignment.
- Tx Inhibit.
- Ambience listening.
- DGNA.
- Security (Security Class 3, GCK, and Enable/Disable, etc.).
- Data services.

C.3.7 Improved performance behaviour of gateways and repeaters

Some members of the TETRA community have expressed a need to provide improved performance behaviour of gateways and repeaters, in areas of, for example, call set-up times, increased range, call set-up reliability, etc.

C.3.8 Multiple call support on gateways and gateway/repeaters

This enhancement area refers to the capability of a single gateway, repeater or gateway/repeater to support more than one DMO call simultaneously.

C.3.9 Application Programming Interface (API)

The API is required in both DMO and TMO terminals to provide a standard interface for use by application providers to supply, for example, internet/intranet access, location information or services applications, etc.

C.3.10 Accessory interface standard (hardwire and wireless)

Although this is not a DMO specific enhancement area, it has been placed in this category grouping as it was not considered appropriate to have a separate MS only category. This suggested interface standard covers for example, the type, size, location, appearance of such items as displays, buttons, switches, as well as the type of connectors, pin usages and electrical/electronic levels, impedances and RF signalling protocols and also the type of batteries.

C.3.11 Networking capability

This networking capability is the same as that mentioned in the TMO Enhancement grouping under "Networking capability for DMO area to DMO area" and has been placed in the DMO Enhancement area grouping to assess its relevant importance compared with other DMO enhancement areas.

C.4 Data Enhancements

As a general rule, most users want increased data speeds and throughput. Even though technology is available to increase data speeds and throughput, the "laws of physics" often means that "trade-offs" in RF coverage and spectrum requirements need to be made, unless the need can justify an increased number of base stations to provide the wide area coverage and/or additional spectrum and resulting increased costs.

Therefore, identifying the relative importance of the data enhancement areas described below should help establish the importance of any standardisation work in the respective enhancement areas.

C.4.1 Increased speed, capacity and efficiency of TEDS

The TETRA standard has already been enhanced for "wide-band" applications with the introduction of TEDS. Even with the high data throughput capability of a TEDS channel, suggestions have been made to further enhance the standard to support higher data throughput, for example, by packaging more bits into a TEDS RF channel (also increases spectrum efficiency) even though there will be a corresponding decrease in RF coverage performance.

C.4.2 TEDS network interface standard with other technologies

As mentioned in TMO enhancements, there have been suggestions from the TETRA Community to introduce standardised interfaces/gateways for interoperability with other technologies more suited for high speed data transfer.

C.4.3 Increased speed, capacity and efficiency of SDS

Even though the SDS service has been serving the TETRA community adequately for several years, suggestions have been made to improve the efficiency of the SDS service (e.g. under highly loaded network conditions) for applications which may require faster delivery, a higher data capacity (beyond the current maximum) and more SDS message capability in the TETRA network.

C.4.4 Local Mode Broadband

Even though the TETRA standard has been enhanced for "wide-band" applications with the introduction of TEDS, some suggestions have been made to further increase data throughput to match that offered by broadband data services. For example, some suggestions have been to provide access to broadband services in certain "hot zones" within a TETRA TMO network coverage area. It was also suggested that "hot zone" coverage should dynamically increased and/or decreased as required for communication purposes.

C.4.5 Networking capability for Local Mode Broadband area to Local Mode Broadband area

To further enhance the capability of broadband services in certain "hot zones" as suggested above, there have also been suggestions to increase "hot zone" coverage by interconnecting different "hot zones" together via the TMO network.

C.5 General Enhancement Areas

These enhancement areas are considered general because most users want continuous improved performance.

C.5.1 RF Coverage

Ability for a radio user to communicate from any location within their operational area.

C.5.2 Capacity

No capacity constraints for any number of users operating at any time at any location within a network's coverage area.

C.5.3 Grade of Service (GoS)

Instant access for communication resources for all radio users, independent of location within a network's coverage area.

C.5.4 Frequency Efficiency

The ability to support a given number of independent communication channels using less frequency spectrum.

C.5.5 Reliability

The network and/or radio terminals never fail providing 100 % reliability.

C.5.6 Voice Quality

The ability to reproduce voice signals that perfectly represent those spoken into the remote transmitting device as well as a reduction of interfering background noise that might be present.

C.5.7 Data Throughput

Ability to send greater amounts of data at higher speeds and in real time.

C.5.8 Security of Voice and Data

Protection against all forms of interception, illegal monitoring and eavesdropping.

C.5.9 Increased availability of frequency spectrum

Availability of sufficient frequency spectrum to meet all user needs throughout the lifetime of a network accommodating new users and new services such as wideband and broadband data.

These general requirements in many cases are considered theoretical ideals. This said, they are very useful in identifying their relative importance regarding the performance of an existing technology.

C.6 Industry Performance Enhancements

The main objective of an open standard is the creation of a market in which users have a choice of suppliers that could meet their requirements thus providing competition, choice and second source security.

Therefore, identifying the relative importance of the industry performance areas described below should help identify the overall importance of TETRA as an open standard, which in turn will help determine the importance of standardisation work in certain enhancement areas.

C.6.1 Increased depth and breadth of standardisation

The depth and breadth of standardisation within a wireless communication network can be enormous. Recognising this, some members of the TETRA Community have expressed a need to increase the depth and breadth of standardisation of TETRA to include for example, a base station interface standard, network management interface standard, a MS Accessory interface standard (hardwire and wireless), a MS Application Programming Interface (API) standard, etc.

C.6.2 Increased implementation of standard/features by manufacturers

As open standards are served by a number of independent and competing manufacturers and suppliers with varying sizes and resources, the rate at which products are developed and services provided varies between manufacturers. Even so, some members of the TETRA community feel there is a need for manufacturers to increase the availability of standardised services and facilities in their products.

C.6.3 Increased IOP between products

Because TETRA has many services and facilities, with several optional ways in which these services and facilities can be implemented and interpreted, the actual interoperability (IOP) between different manufacturer's products in the field can in some instances be limited and late to market. Because of this effect, some members of the TETRA community feel there is a need within TETRA to increase IOP between different manufacturer's products.

C.6.4 Increased competition and choice between manufacturers and suppliers

When considering its size, the TETRA market is already served by a relatively large number of independent manufacturers of both TETRA Infrastructure and terminals. This said, some members of the TETRA community feel there is a need to increase the number of independent manufacturers and suppliers addressing the market.

History

Document history		
V1.1.1	April 2008	Publication