The Emergency Communication Centre of the Future: From Reactive to Proactive

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"Rather than trying to convince the public to adjust to the way we at the Federal Emergency Management Agency communicate, we must adapt to the way the public communicates by leveraging the tools that people use on a daily basis." (Craig Fugate, FEMA Administrator, 2011)

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EXECUTIVE SUMMARY

How will the Emergency Communication Centre look in the future?

Top disruptors for emergency communication centres

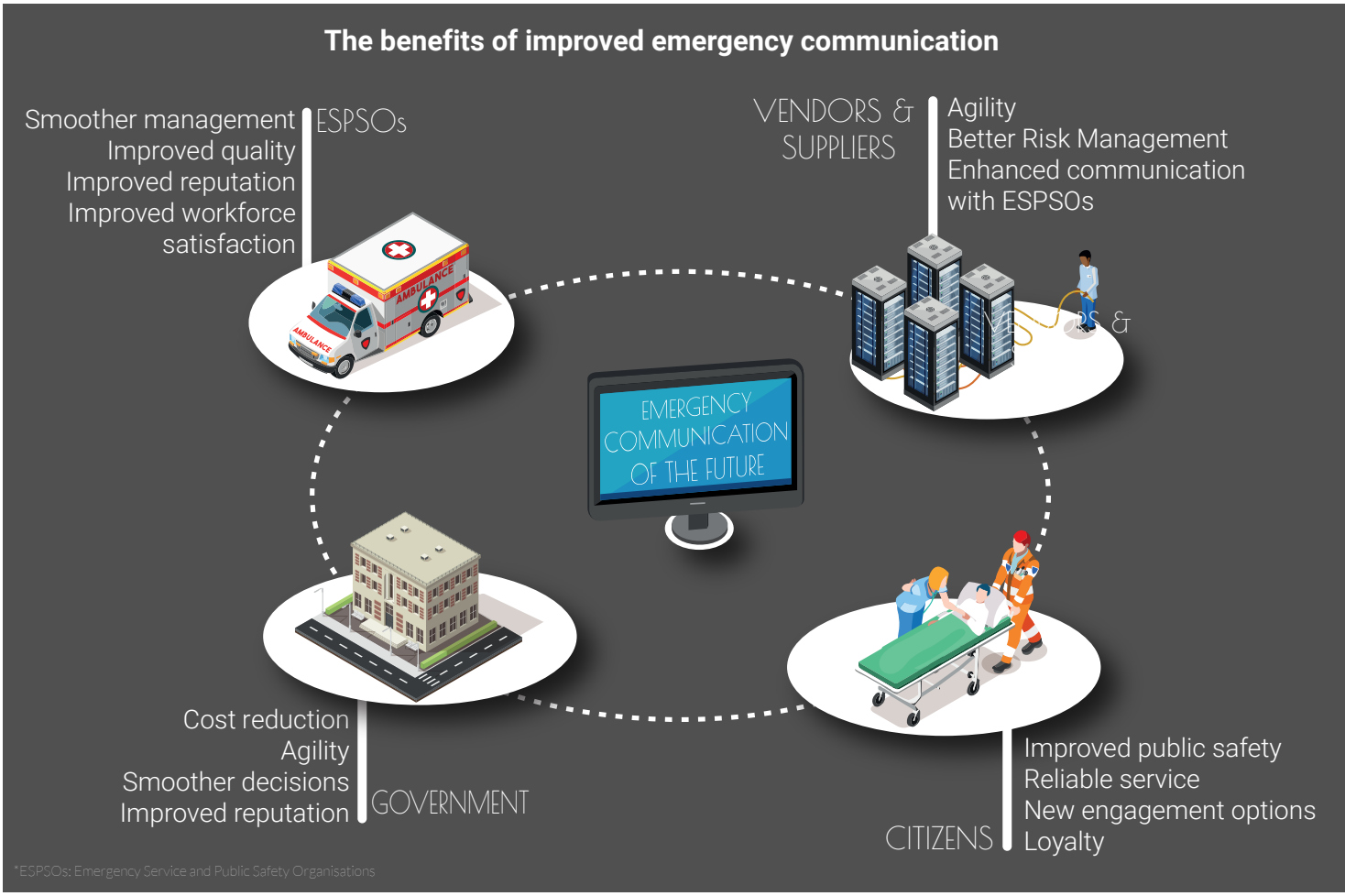
New technologies (e.g., cloud computing, driverless cars and Internet of Things)

Global issues and domestic competition

Business models

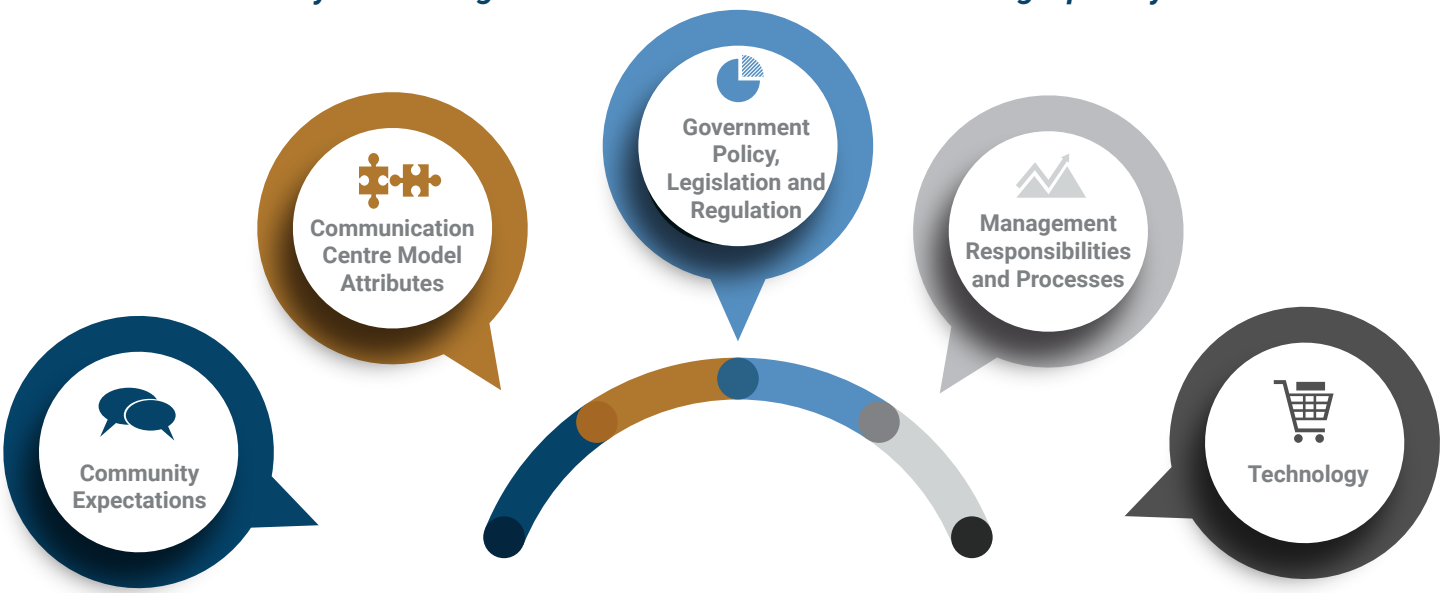
Workforce management

Changing community expectations



Strategic priorities for emergency communication services:

How can we build the Emergency Communication Centre of the Future?
By co-creating its characteristics around the following 5 priority areas.



SENSE THE FUTURE
Shape the design of emergency services based on the environmental dynamics

COMMUNICATE
Explain to your customers and stakeholders what you are doing for them

BE CUSTOMER-DRIVEN
Ask your customers what they would like you to do for them

BE AGILE
Evolve traditional command-and-control into an agile organisational structure

CONNECT
Bring together organisations to collaborate on crises and emergencies

CO-CREATE SERVICES
Involve customers and vendors in the organisational fabric of emergency communication

CO-DESIGN SOLUTIONS
Join design efforts to create a centralised call-taking and dispatching centre

DRIVE POLICY-MAKING
Support regulatory change to match technological innovation and community expectations

SHARE SKILLS
Derive the next-gen emergency communication skills from a wide range of professions

SHARE YOUR INFORMATION
Make emergency organisations share information about their customers

BUILD CAPABILITIES
Teach the emergency communicators of the future a broad range of 'languages'

BE DIGITALLY INTELLIGENT
Strategically design security and privacy in the information-sharing environment

MASTER BIG DATA
Facilitate 'total conversation' through seamless convergence of different data sources

LOCATE SIGNALS
Always capture the specific location of your digital signals

1. INTRODUCTION

The working environment of the Emergency Service and Public Safety Organisations (ESPSOs) is profoundly changing. Disruptive dynamics such as globalisation, changing community expectations and large-scale use of digital technologies are impacting the very heart of how individuals, organisations and governments deal with emergencies. The National Emergency Communications Working Group - Australia and New Zealand (NECWG-A/NZ), established to address the core issues of the Emergency Call Service in both Australia and New Zealand, has, as part of their agenda during this decade, addressed what the Triple Zero (000) service of the future will look like. Similarly, NECWG-A/NZ is currently debating what key disruptors ESPSOs will face in the future and what the design of the Emergency Communication Centre of the Future (ECCF) will be.

This report originates from a partnership established among three principal players: NECWG-A/NZ, PwC and QUT PwC Chair in Digital Economy (PwC Chair). In particular, the PwC Chair was asked to provide its support with: 1) nurturing conversations on the occasion of the 3rd Industry Engagement Forum, and 2) creating this *Thought Leadership Report*, intended as a document to further strengthen the current debate around the topic and help policy-makers, managers and operators understand the future trends in the Emergency Service and Public Safety Organisations (ESPSOs) scenario.

1.1 The event

Held in Manly (NSW) on the 24th May 2017, the Industry Engagement Forum saw the participation of around 100 representatives from the public safety industry across Australia. The audience also included some vendors and consulting firms who presented their views on the core topic of the event, the Next Generation Communication Centre environment. In the morning, a panel discussion and a keynote speech served to update the audience on the initiatives carried out by the NECWG - A/NZ and to set the stage for the afternoon workshop. The workshop saw the participants in the Forum divided into 8 groups, which were tasked to brainstorm 5 key issues that were identified as crucial for the future of emergency communication centres.

The remainder of this document is organised as follows: a concise review of the literature on some of the most compelling managerial and socio-economic issues associated with the core topic, an overview of the findings from the groupwork conducted in the workshop (Activities 1-5); subsequent identification of the areas that are worth further exploration by NECWG - A/NZ and the other stakeholders; a presentation of recurrent, transversal themes; in conclusion there is a *flash-forward* on what a *proactive emergency communication centre* could look like with the recommended next steps on this project.

Figure 1: the most recurring words in the data collected during the workshop ('wordcloud')'

2. A BRIEF LITERATURE REVIEW

In the light of the extensive disruptions that digital technologies are bringing, ESPSOs have initiated a long process of adaptation, with the ultimate goal of improving the quality of the services provided. This entails a re-thinking of their Communication Centres, which, in their traditional formulation, do not seem able to support the richness and variety of information sources that end-users (e.g. people affected by an emergency) utilise. With the affordances enabled by digital technologies and the changing perceptions and expectations that citizens have with regards to the role of ESPSOs, the delivery of the Emergency Call Service (ECS) appears to be only one way in which ESPSOs can produce public value. This further invites ESPSOs to reformulate their value proposition, their business models and the services provided to society.

In recent years, a number of issues have emerged in the problem-space that characterise ESPSOs. These are illustrated in the remainder of this section.

Location Information.

One of the areas in which the involved stakeholders have invested the most is in the need to improve location information associated with the ECS. As 65% of calls made to Triple Zero (000) (Australia) or 111 (New Zealand) come from mobile phones (NECWG - A/NZ 2017), establishing the caller's location solely relies on the caller's ability to identify their position and communicate it to the operator. Advancements have been made in this area since 2011, when cell based information was first made available through the so-called 'Pull Mobile Location Identification' (Pull MoLI). This system evolved in 2015, with the creation of the 'Push MoLI', which automatically 'pushed' the location information (based on the location of the nearest cell tower) from telecommunications carriers to the ESPSO. Similarly, in New Zealand, a system has been launched to enable ESPSOs to send an SMS to the caller and request access to their GPS data to identify their location (PCL: Possible Caller Location). In 2013, the 'Emergency+' app was launched to enable the caller to verify their GPS location (based on the

technology native to their mobile phone) and communicate it to the operator.

Next Generation Triple Zero (NG000).

In 2014, NECWG - A/NZ engaged PwC and launched the Next Generation Triple Zero (000) Strategy (NG000), which calls upon a multi-channel approach, interoperable systems and enabling technologies together with an agile operating model to enable a seamless multi-channel communication between the community and the responders (NECWG - A/NZ, 2014). The NG000, which considers similar experiences in other countries (e.g. the US and Europe), advocates the use of different technologies (SMS, mobile apps and real-time text, videos, social media and Web/VoIP) to converge on the Communication Centres to provide an improved ECS, animated by the concept of 'total conversation', in which one channel is soon coupled with different others to create a richer communication experience. To pursue this NG000, NECWG - A/NZ recommends involved stakeholders to act in three specific areas: building mutual engagement, identifying an appropriate governance platform, and creating a transparent, flexible funding model.

New threats.

A second area of attention emerging in recent years refers to the changing nature of modern, large-scale threats (e.g., terrorism and natural disasters) and to the delivery of ECS in such situations of extreme distress. As the number and magnitude of natural disasters are increasing (EM-DAT, 2017), which for some is because of the changing nature of our climate (Bennett, 2016), the delivery models of ECS in such extreme situations also need to be changed. Further, the rise of major terror-related threats, even though not directly affecting Australian soil so far, questions the country's crisis management capabilities, especially in terms of security crisis response. How would ESPSOs respond to a massive influx of emergency calls resulting from a major terrorist event in the country?

On a similar note, cyber-threats directly targeting ESPSOs and their communication and IT apparatus could significantly jeopardise emergency communication operations with frightening consequences for the end-users.

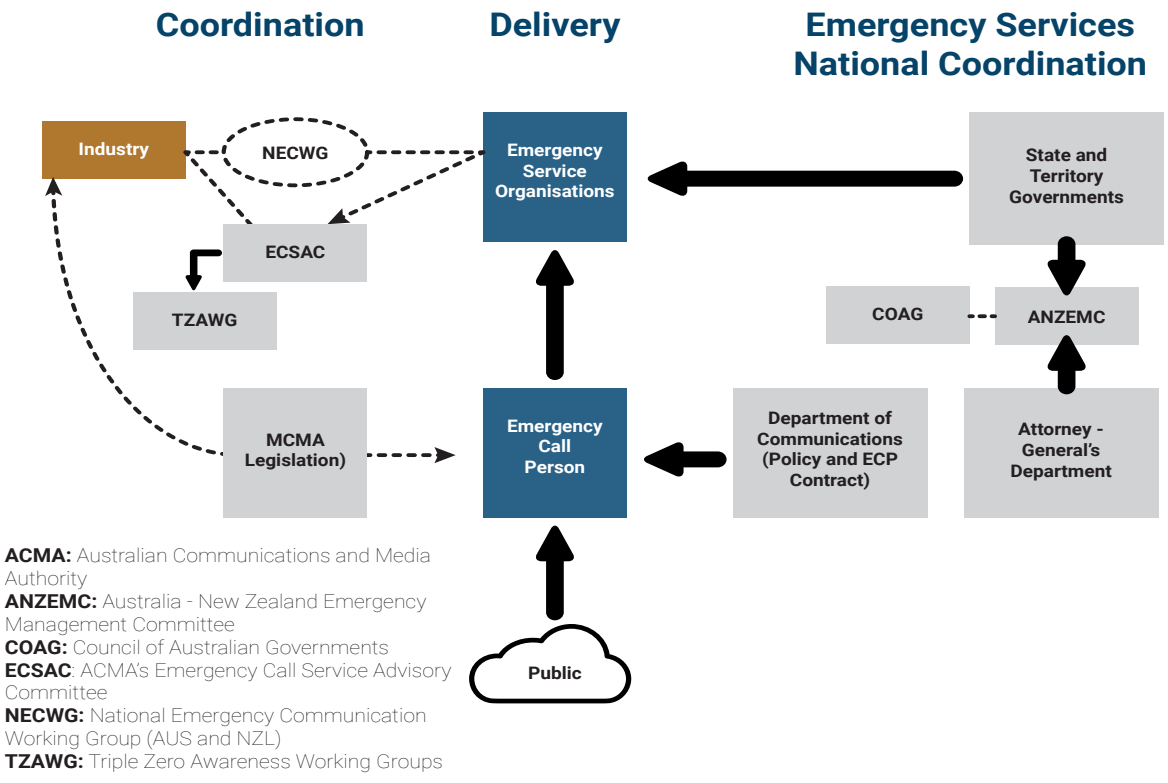


Figure 2: Triple Zero Coordination Arrangements

An evolving governance model.

In 2015, the Department of Communications and the Arts conducted a thorough review of the National Triple Zero (000) Operator (Department of Communications and the Arts, 2015), composed of a quali-quantitative assessment of the ECS with all the involved stakeholders. The report highlighted a general satisfaction with the Triple Zero (000) service (91%) and an opportunity for the government to explore alternative methods to voice-call contacts (automated alert devices and smartphone apps, and also SMS and video-calls). The fact that there is no single body in charge of supervising and managing the end-to-end delivery of the ECS has both benefits and limitations. On a positive note, flexibility and agility can be more easily achieved when different organisations share the responsibility for such a crucial service. On the other hand, the complex framework underlying the coordination of ECS can lead to misunderstanding and issues with inter-organisational communication. The presence of variously distributed emergency call centres entails diverse designs, models and technologies developed in the territory. A picture of the existing governance and coordination arrangements within the Triple Zero (000) service is represented in Figure 2 (Department of Communications and the Arts, 2015, p.42).

The aforementioned governance model refers in particular to the ECS and the Triple Zero (000) service. It is clear that future evolutions in terms of expansion of utilised technologies and delivered emergency services will require an analysis of the current coordination model investigate a possible need for adaptation. The Department of Communications and the Arts (2015) provided the following recommendations with regards to the existing governance model for the Triple Zero (000) service:

- A Triple Zero (000) coordination committee should be established to replace ECSAC and to examine and coordinate the end-to-end operational aspects of Triple Zero (000);
- The Triple Zero (000) coordination committee should set a list of non-binding policy principles for national endorsement;
- The Triple Zero (000) coordination committee should supervise a national awareness strategy around the service.

Costs associated with expanded business model.

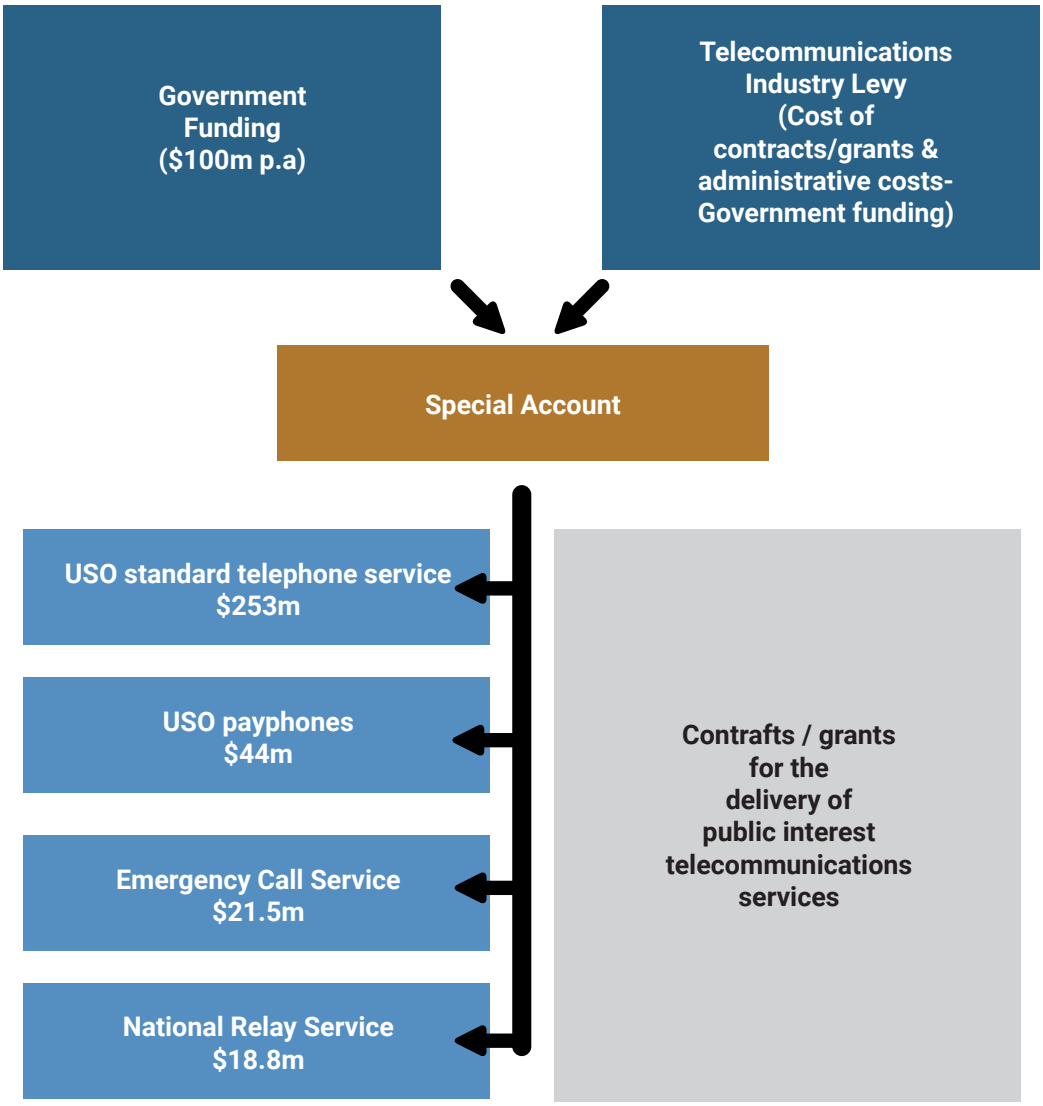
A third area for ESPSOs' reflection refers to the costs associated with managing and innovating the ECS and expanding ESPSOs' range of offered services. This domain is strictly related to the utilisation of the ECS from a threefold perspective: the caller, the operator (Telstra) and the ESPSOs. The report also emphasises the current funding model, which is reported in Figure 3 (Department of Communications and the Arts 2015, p.51).

The sum currently paid to Telstra for the delivery of the ECS is a flat rate not associated with the number of received, processed and/or connected calls. The Department of Communications and the Arts (2015) provided the following recommendation as to the funding model for the Triple Zero (000) service:

- In the light of likely service changes in the future, the Triple Zero (000) coordination committee should enhance the collaboration between jurisdictions and organisations to build and develop business cases for any major changes.

As confirmed by the Department of Communications and the Arts (2015), a look into the future of the emergency communication services presents a situation in which the services offered could potentially expand in number and extent. This requires the involved stakeholders to potentially re-think the underlying funding models (e.g., by introducing *dynamic pricing* options, which are based on a pay-as-you-use approach). Also, the affordances derived from modern digital technologies could have a balancing effect (e.g., reducing costs) with regards to the expansion of the services offered.

On 6 October 2016, the Australian Government put out a request for expressions of interest for the Triple Zero (000) service for the first time in its then 55-year history. On 22 June 2017, the Government announced that it had decided to cease to proceed with the two requests for



1. USO: Universal Service Obligation, one of Telstra's delivered public interest telecommunications services.

Figure 3: Triple Zero Current Funding Model

expressions of interest for the Triple Zero (000) and 112 Emergency Call Service and improved location services on public interest grounds. Instead, a Request for Tender will be issued by the Government to the open market for a provider to deliver both the ECS and accurate location-based data services, possibly in August 2017 (Telecompaper, 2017). During the expression of interest process, Advanced Mobile Location (AML) technology was identified as the most appropriate to provide location-based data.

Changing nature of volunteering.

Another element of the ECCF to consider is a fundamental actor in the Australian crisis and disaster management scenario, the volunteers. The landscape of disaster volunteering is profoundly changing, as indicated in a recent study by McLennan, Whittaker and Handmer (2016). In particular, four trends were observed:

- Volunteering styles are more diverse, shifting from a traditional, life-long commitment to a short-term, episodic type of volunteering in

which individualism, desire for autonomy, personal rewards and loyalty to a specific cause (rather than an organisation) prevail;

- Communications technology is experiencing a revolutionary change, which has led to the concept of 'digital disaster volunteering'. Volunteers offer their data and capacity to manage, collate, organise and disseminate such data (e.g., social media) to create meaningful information. Research has shown that they are more effective than government organisations in doing so (see for example, Bruns and Burgess, 2014);
- The private sector is becoming more involved in the crisis management life-cycle stages (prevention, preparation, response and recovery);
- For various reasons (e.g. rise of new, mixed welfare models), government organisations are progressively encouraging volunteering initiatives to face disasters.

Proactive Organisations.

Research shows that proactive organisations, which are able to anticipate customers' needs even before such needs manifest, are characterised in particular by their ability to: capture and fruitfully use digital signals; identify the most appropriate moment to offer services to their customers; and deliver such services utilising the most appropriate model (QUT PwC Chair in Digital Economy, 2015). What are the main characteristics of these organisations that allow them to be proactive? Seven traits in particular distinguish them from other organisations:

1. Customer centricity: Delivering value for customers is the core target of proactive organisations. Everything else is secondary;

2. Initiative: Proactive organisations re-think their value proposition to take the initiative in customer interactions. They do not wait for customers, but proactively help customers find out what their needs are;

3. Data: Building capacity to capture and process digital signals is a key capability of proactive organisations. They focus on signals coming from customers as well as from the environment in general;

4. Transparency: Proactive organisations avoid being perceived as "creepy". They explain to their customers how they predict their needs;

5. Trustworthiness: The importance of trust is a constant factor in the digital economy and proactive organisations know this very well. They make trust transparent and evident to customers;

6. Agility: Supporting a culture of learning, experimentation and exploration is a common modus operandi for proactive organisations. Agility allows them to remain relevant in the long run;

7. Environmental awareness: Proactive organisations are composed of a team that focuses solely on identifying trends that are relevant to them and their customers. This allows their business to stay ahead of the game.

Such trends present an opportunity for ESPSOs to re-think the way in which they conceive their 'command-and-control' dynamics, in an environment in which decentralisation and distribution of authority and responsibility in emergency management seem the new norm. This factor, coupled with the disruptions brought by new technologies and the changing nature of modern, 'asymmetric' threats, is expected to be reflected in the way communication centres will be organised and supervised in the near future.

3. ENGAGEMENT WORKSHOP

The ultimate goal of the ECCF project is to understand what ESPSOs and associated stakeholders can do to be 'future-proof'. NECWG - A/NZ is the leading group of this discovery phase, in which a series of events has been regularly organised to collect, analyse and share information from emergency service and public safety organisations. The underlying assumption is that the opinions of these subject matter experts, combined with the suggestions and solutions emanating from several commercial actors (e.g., vendors) together with the visionary perspective of other experts in the area, can provide an educated perspective on how the

Emergency Communication Centre will look in the future.

In the 3rd Industry Engagement Forum, following the plenary session, around 100 participants from ESPSOs, commercial entities, consulting and academia engaged in a series of strategic thinking exercises, aimed at informing the debate around the topic of the project. The following sections present the findings which emerged from these exercises.

3.1 Activity 1 - The Quest for Disruptors

A first area of focus for participants to delineate their vision on the ECCF involved identifying the key disruptors (innovations, changes and/or unknowns) that will influence ESPSOs' communication working space. Interestingly, participants in the workshop adopted a 'neutral' stance when discussing disruptors, and tended not to associate either a positive or negative meaning to the term. In business, disruptors can be interpreted as "*a company that changes the traditional way an industry operates, especially in a new and effective way*" (Cambridge Dictionary, 2017). Participants in the workshop generally agreed with the fact that disruptors cause the status quo to change and adapt to surrounding, external forces (e.g., a new platform for emergency communication). However, participants did not necessarily provide interpretations on *'new and effective'* ways to operate in the emergency communication industry. Another element worth mentioning is the fact that participants essentially considered three levels in which such disruptors have an impact: *inside organisations*, *outside organisations (supplier side)* and *outside organisations (client side)*. Figure 5 provides an illustration of this.

Figure 4: The most recurring words in Activity 1 (wordcloud)'

Key Disruptors and their Impact

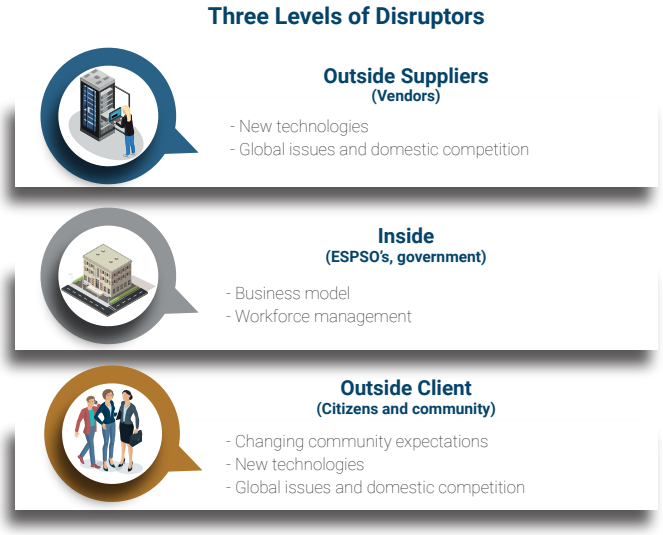


Figure 5: Three Levels of Disruptors

Participants identified the following factors as disruptors that are likely to create opportunities or challenges for ECCF. Disruptors are presented here together with the number of comments in which they were specifically mentioned by participants.

New Technologies (48 comments)

Participants identified the introduction of new technologies and the speed of technological change (3 comments) as the main factor to disrupt communication centres. Such technological changes include the cloud, driverless cars and digital technologies such as the Internet of Things (6 comments). Overwhelmingly, participants identified new communication technologies (23 comments) as the main technological disruptor for communication centres. The introduction

of new digital technologies may lead to a reduced community reliance on traditional voice communications such as telephones, causing a current downturn in workload (2 comments). Participants expect increased use of mobile devices, enabling users to communicate with call centres by multiple devices and communication platforms such as video and e-calling, social media, and end devices developed by users.

However, participants anticipate that challenges created by the new technologies will include their changes to agency expectations of vendor products (1 comment), increased volume of data (4 comments), the requirement for interoperability between platforms (3 comments), and cyber security (8 comments).

Global Issues and Domestic Competition (43 comments)

Global issues and domestic competition from other emergency service organisations were identified as disruptors that would create opportunities and challenges for communication centres of the future. Participants noted that issues such as globalisation (1 comment), climate change (5 comments) and border control (1 comment) were disruptors. Moreover, some participants stated that international standards were being forced (1 comment), and regulations and business practices were struggling to keep pace with change (2 comments). More importantly, competition in the emergency services sector was a major disruptor for the industry (13 comments), caused by the stratification of services, private sector outsourcing, and people bypassing emergency services and using community-based services.

These disruptions created challenges and opportunities that included new government policies and strategies, a new system of governance that was agile (1 comment), and new legislation. A major challenge is the competition for public funding and the costs associated with compliance (5 comments). There are some suggestions for changes to funding models such as a consumption based funding model. Another challenge is the requirement for legislation and regulation of data (3 comments). A major concern for participants was the current legislative environment that inhibits the sharing of data between agencies, as stated by one group "*restrictive regulation inhibits sharing data across agencies*". Therefore, the sector is seeking changes to legislation that will allow information sharing between agencies (11 comments).

Business Models (26 comments)

Another issue that was important to participants was the inadequacy of current business models. Participants had questions about the current management structure of "command-and-control" (3 comments), suggesting the need for a changed management style (2 comments). Changing business models also required management to consider issues such as the need to consider the best value of investments and the time for implementation of new technologies or systems, ensuring their relevance. Emergency service organisations also faced the challenges of managing risk, change management, and meeting KPIs. Management also need to consider new decision-making models that include predictive analysis and big data analytics (5 comments).

Workforce Management (26 comments)

Another disruptor for communications centres is the change in workforce demographics. These changes are caused by disruptions in technology (6 comments) that require changes in skillsets (2 comments), also causing disruption in work-style, such as the ability to work remotely from home (4 comments). Such disruptions mean that management are challenged to optimise the workforce by employing staff who are flexible and engaged with their work, while also recognising their obligations in "*attracting, training and retaining a sustainable workforce*", and ensuring staff welfare.

Changing Community Expectations (22 comments)

Participants also noted that changes in community expectations are disrupting communications centres. Such changes are caused by population growth, aging populations, migration, and growing distances from city centres (4 comments). Community expectations are also changing (5 comments) due to customers perceiving an inadequate emergency service response. Moreover, customers are losing trust in

the inflexibility of the current system that relies on voice technology and is unable to provide data security (7 comments).

The resulting challenge for emergency service organisations is that they must be transparent and visible, whilst communicating openly with the public (6 comments).

Opportunities and Recommendations

Based on the findings from the participants' perspective on the key disruptors in the emergency communication environment, the following opportunities and recommendations are proposed to NECWG - A/NZ. In section 4, these are translated into *calls for action*, which represent options for emergency communication services' strategic future.

- Maintain a focus on different emerging technologies (e.g., cloud, Internet of Things, etc.), to explore the feasibility of 'total conversation' environments;
- Maintain current efforts on location information applications and accordingly adjust investments on the 'Emergency+' app (the latter could become less relevant vis-à-vis advancements in the former);
- Expand the dialogue with the regulatory bodies to ensure legislation is not "caught in the middle" between technological advancements and community expectations;
- Re-think the current "command-and-control" organisational structure within communication standards and identify options for more agile models;
- Intensify efforts on better communication with external stakeholders (e.g. communities and private emergency actors).

3.2 Activity 2 - A Brighter Future: Focus on Benefits

In order to identify the impact that an improved, innovative ECCF would bring, participants provided an overview of the key opportunities and benefits potentially deriving from it, for a set of stakeholders: *citizens*, *ESPSOs*, *vendors and suppliers* and *government*. Largely, participants' comments revolved around enhanced communication among the different stakeholders involved in the emergency communication domain. This, in turn, is expected to increase the ultimate value produced, **public safety.** A visual representation of the stakeholders, their benefits and opportunities is illustrated in Figure 7.

Opportunities and Benefits of Improvements

Emergency Service and Public Safety Organisations (43 comments)

Participants report that innovation and improvements in the emergency communication environment will bring the following benefits: smoother management decision support (a more flexible information flow across organisations; 16 comments), service quality improvement (13 comments), improved reputation (8 comments), and greater workforce satisfaction (6 comments).

Participants expect that the management of ESPSOs will have greater opportunities and benefits by being able to focus on their core business. Decision making is expected to improve through agile working relationships with vendors, better information sharing, better resource management and reduced liability. Service quality improvement will be achieved through better

Figure 6: The most recurring words in Activity 2 (wordcloud

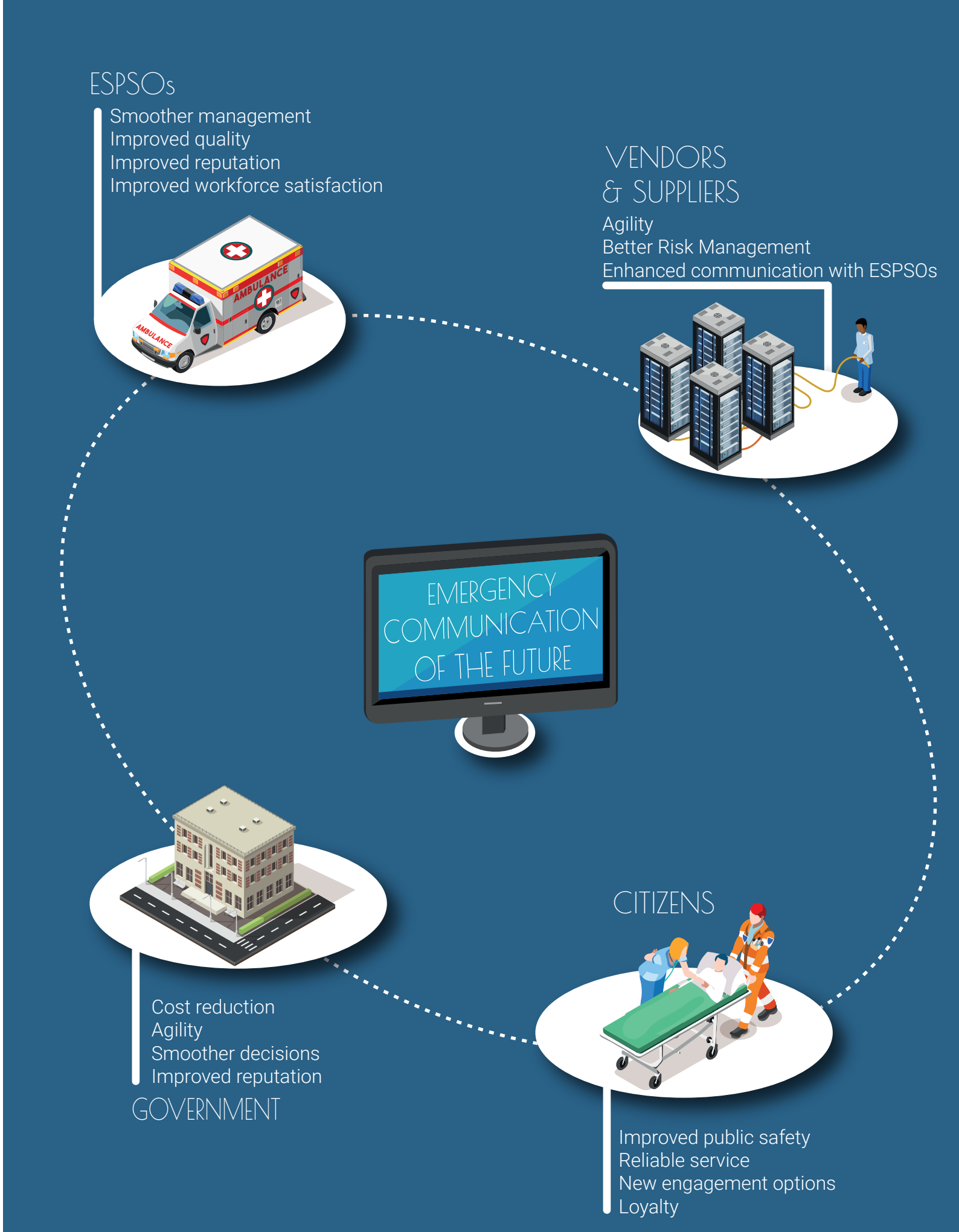


Figure 7: Benefits of Emergency Communication Centre of the

prediction and emergency management. More efficient triage, response and dispatch will be realised through interoperability and mobility solutions (e.g., use of wearable technologies). Improvements to communications centres will mean better overall safety for the community. Participants expect that emergency service organisations will also receive "*reputational improvement*" (citizens having a positive sentiment towards ESPSOs), increased staff productivity and improved staff wellbeing and satisfaction.

Citizens (25 comments)

Participants report that the opportunities and benefits of improvements to communication centres include a prompt and reliable service (5 comments) that provides better public safety (8). Improvements to the communication centres and to communication platforms will also provide an opportunity for greater partnership with the community, enabling the communication centre to communicate with the community through messaging services and allowing customers to engage in a variety of ways (8 comments). These developments will then increase community satisfaction and reassurance.

Government (25 comments)

Participants envisage many benefits for governments through improvements to communication centres. Such benefits will mean cost reductions and "*improved public value through improved services*" (8 comments), with the expected financial benefits being achieved through new models of public and private partnership (3 comments). Participants also expect smoother decision support for governments (2 comments) through an agile working relationship between ESPSOs and government (7 comments). Governments will understand the work of ESPSOs better and will have access to "*real-time information*".

Participants also foresee service quality improvement (5 comments) that will increase public satisfaction, and thereby improve government reputations.

Vendors and Suppliers (18 comments)

The opportunities and benefits for vendors and suppliers include better engagement with ESPSOs (7 comments), enabling more agile solutions (4 comments) and better risk management (1 comment). More competition from other vendors is expected (2 comments), and a consumer based model will mean less reliance on dedicated hardware (3 comments). Improved corporate social responsibility as a result of a wider range of involved stakeholders was also mentioned (1 comment).

Opportunities and Recommendations

The general agreement that the greatest area of benefit deriving from improvements in the emergency communication environment is communication itself (both internally, among ESPSOs, and externally, with regards to communities) suggests a need for NECWG - A/NZ to further invest in this area to:

- Elicit the ECCF's role as a "socio-technical" platform in which internal and external actors converge to exchange information about crises or emergencies;
- Expand end-customers' role in the ECCF by involving them in research intended to answer the following questions: "what do you expect from the ECCF?", "what type of information would you like to know when you find yourself in a situation of distress?", and "what should the ECCF look like?";
- Provide opportunities for end-customers' and vendors' involvement with current emergency communication operations;
- Intensify opportunities for emergency professionals' secondment within the current emergency communication centres (e.g., health or fire brigade professionals within the Police emergency communication centre);
- Multiply opportunities for ESPSOs to increase information sharing beyond emergency services.

In section 4, the above recommendations are translated into *calls for action*.

3.3. Activity 3 – Caveats on the Horizon: What Challenges?

As well as benefits and opportunities, risks and challenges need to be considered by the stakeholders in their way to build the ECCF. Participants identified a number of these, while maintaining the proposed stakeholder mapping: *citizens*, *ESPSOs*, *vendors and suppliers* and *government*. A synthesised overview of the findings is proposed in Figure 8.

Key challenges and risks

Emergency Service and Public Safety Organisations (42 comments)

Participants expected a variety of challenges for ESPSOs. Emergency management was perceived as a major challenge or risk, with the need to prioritise services with the expected increase in demand (9 comments). Other concerns are the reliability of information given during emergencies and geographic location challenges.

While the older technology is limiting for ESPSOs, new technology provides opportunities for emergency alerts to the public and early intervention in emergencies. However, while investing in new communication platforms, there may be an ongoing need to invest in redundant systems. Moreover, the newer technologies will require regulatory frameworks and have security implications (9 comments).

Figure 9: The most recurring words in Activity 3 (wordcloud)

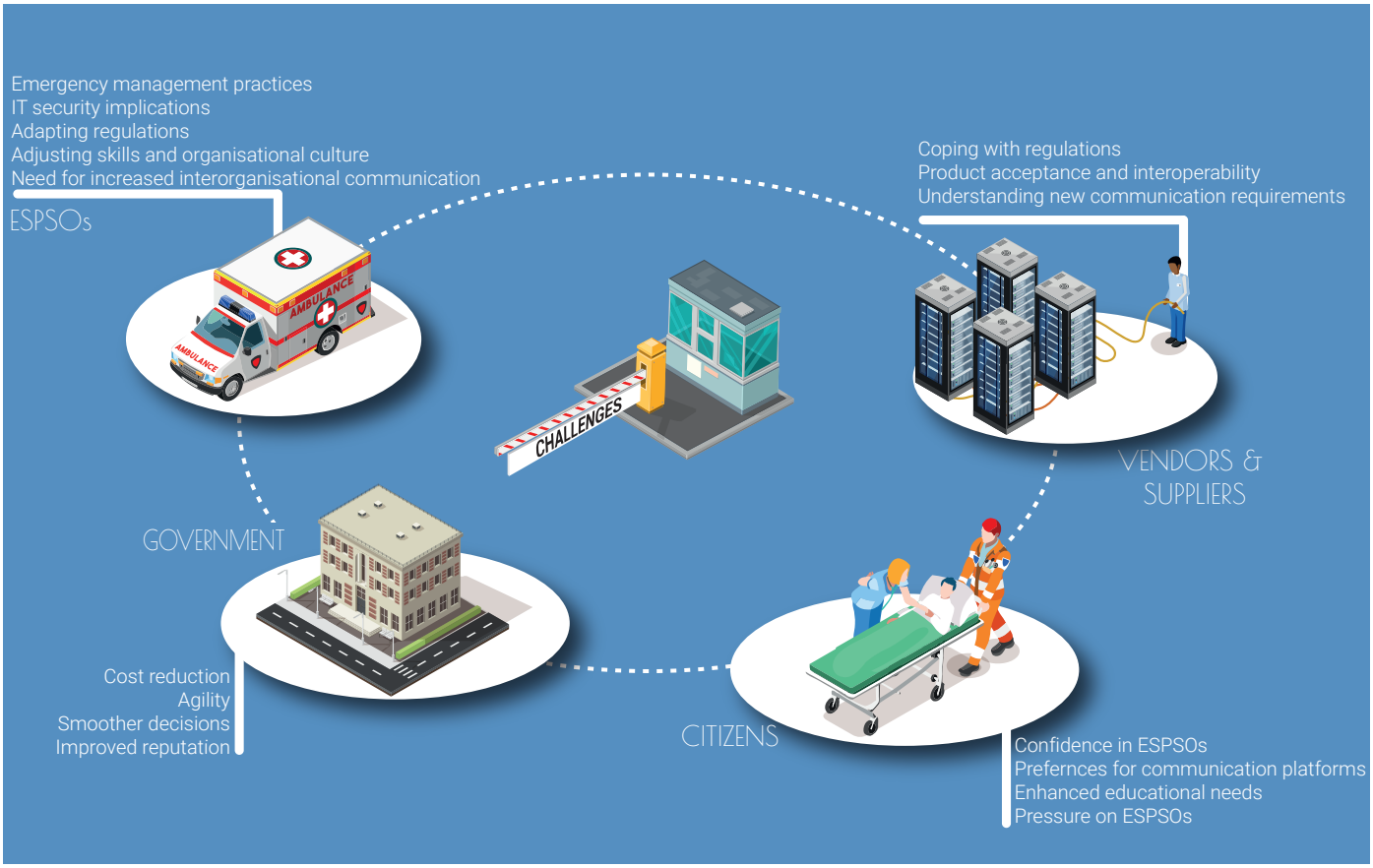


Figure 8: Stakeholder Challenges

Changes to communications centres will also have implications for leadership and management (4 comments), with a reduction in costs, but requirements for skills in decision making, risk management, change management and organisational culture (11 comments). The expected increased volume of data will require experience and skills in data assessment, taking note of changing demographics, and understanding the need for data security and privacy (3 comments).

Some participants also perceive that the privatisation of emergency services (6 comments) will entail the loss of service standards as organisations strive to compete, but also require greater communication between agencies. A final challenge is the continued need to ensure the community's confidence in the ESPSOs.

Citizens (37 comments)

Participants perceived that one of the key challenges and risks of communication centres for the community is new technology (13 comments). According to participants, these challenges include the various preferences people have for different communication platforms (2 comments), securing public safety mobile broadband (1 comment), predictive technology (1 comment) and community concerns about security on their mobile devices (2 comments). The public also have concerns about the privacy of their personal data (2 comments).

Another challenge is the need for public education about new technologies and processes, particularly with older generations (5 comments).

A final challenge is that the expected improved public confidence in ESPSOs will lead to increased consumer expectations and reliance upon them creating more pressure upon them to perform (13 comments). However, some participants also perceived that the risk of changes to communication centres may include less reliability (1 comment), greater losses, for example, on insurance (1 comment), a loss of community confidence and a need to improve the brand (4 comments).

Government (28 comments)

Participants viewed the challenges and risks for government as the legitimacy of the government and police (15 comments). This meant that in order to maintain legitimacy, governments struggle with bureaucracy, public order, emergencies and public expectations. Participants saw the major challenge for governments as enacting legislation and standards that are keeping up with technology change (8 comments). Legislative challenges include public safety mobile broadband, interoperability, and cyber security and privacy. The final challenge for governments is maintaining funding to provide sustainable emergency and public safety services (5 comments).

Vendors and Suppliers (5 comments)

Five participants' comments noted that a competitive market drives innovation, with vendors more likely to invest in research and development. Vendors' challenges included ensuring that they understood the expectations of the communications centres. Another risk for vendors is that delays in regulatory frameworks can cause problems for the sustainability of their businesses. Challenges and risks for vendors include product acceptance and technical challenges such as interoperability, optimising standard architectures, and providing local and global solutions.

Opportunities and Recommendations

In the light of the risks and challenges identified for the ECCF, the following recommendations are drawn. In section 4, the same recommendations are translated into *calls for action*.

- Map and identify the future services that the ECCF is expected to deliver;
- Build new skillsets needed for the ECCF (e.g., training around new technologies, establishment of graduate programs with science and engineering universities);
- Invest in understanding the privacy and security implications associated with the increased information sharing entailed by the ECCF.

3.4. Activity 4 - Make it All Work: Business Model Options

Creating and rolling-out the ECCF requires the involved stakeholders to possibly re-think their current model options to suit new affordances and constraints. Participants provided their view of this issue, focusing in particular on the people, process, technology, data facilities and governance options. The framework utilised by the participants focused on an emergency communication centre's key functions: *receive contact*, *triage*, *respond* and *outcome*.

Figure 10: The most recurring words in Activity 4 (wordcloud)

Participants analysed various models for the ECCF. In general, they agreed on the relevance of a proactive model, moving from receiving information to predicting emergencies and initiating contact with customers. Participants also saw future models as striving for continuous improvement, working upon alignment with standards and training staff for same. The present section illustrates some of the models discussed by participants.

Current Models (42 comments)

Participants envisaged that the current Triple Zero (000) model would require auto location on phones (3 comments).

Participants considered the current Australian model (33 comments). While it contained old and expensive technology, its processes were established and adaptable and there was internal control of staff. Nevertheless, management needed to consider industrial relations, training and costs, and the availability of staff. Maintaining the status quo with this model was considered the lowest risk option with only incremental changes, although costs were high, with expensive facilities, and it was affected by both Commonwealth and State governments and legislation. Further, participants considered that data volume, storage and security, and data analysis and sharing with other agencies were problems to be considered.

The Victorian Emergency Services Telecommunications Authority (ESTA) model (insourcing) was also considered (6 comments). Participants assessed: that it only handled a single communication platform, that procedures were rigid, data was handled in-house, and that staffing was high cost. On the positive side, participants considered that the current system was already regulated and facilities were lower cost.

Centralised National Call-Taking and Dispatching Centre (87 comments)

Many comments addressed a completely centralised communication centre model (87 comments). This model could reflect a national centre that could take calls for all agencies and dispatch across agencies, providing greater integration between agencies and private providers.

According to some participants, the positive aspects of a national communications centre would vastly outweigh the negatives. Some participants indicated that such a model could reduce surge in demand problems, provide a more tailored response and a consistent service to all locations (2).

Other participants saw many benefits of this model in the implementation of technology. Generally, participants envisaged a technology model that could provide interoperability between multiple communication platforms (12 comments), standard-based information exchange (2 comments), allowing for "*integrated computer-aided dispatch communication*" (3 comments) and cloud based services (1 comment). It was expected

that such a system could provide "*analytic tools to automate data interpretations*" (7 comments). The benefits of such a system were that it would provide consistency (1 comment), richer data (2 comments), and an increased automated response for low level response calls (3 comments). It was also expected that procurement would be more flexible, with the technology easily updated and constantly refreshed (2 comments).

Another major benefit of this model was indicated in the potential efficiencies in resource allocation (12 comments) primarily through the expected redundancy of facilities (5 comments), although such rationalisation was expected to address transparency of funding issues across all states (1 comment).

Other benefits of this model could be the standardised processes for primary call-taking triage (3 comments), with the expected redundancy of interstate communications centres, the access to a bigger staff pool (1 comment), and the expected, potential improvement in public confidence in emergency service organisations.

Negative considerations envisaged by some participants included the need for training to multi-skill staff for the integrated systems and processes (3 comments); and the possibility that the responder may be a private service provider (1 comment). Another consideration made is that the expected increased volume in data could require the recruitment of skilled staff and specialists who could engage in intelligence gathering, data management and data analysis (5 comments).

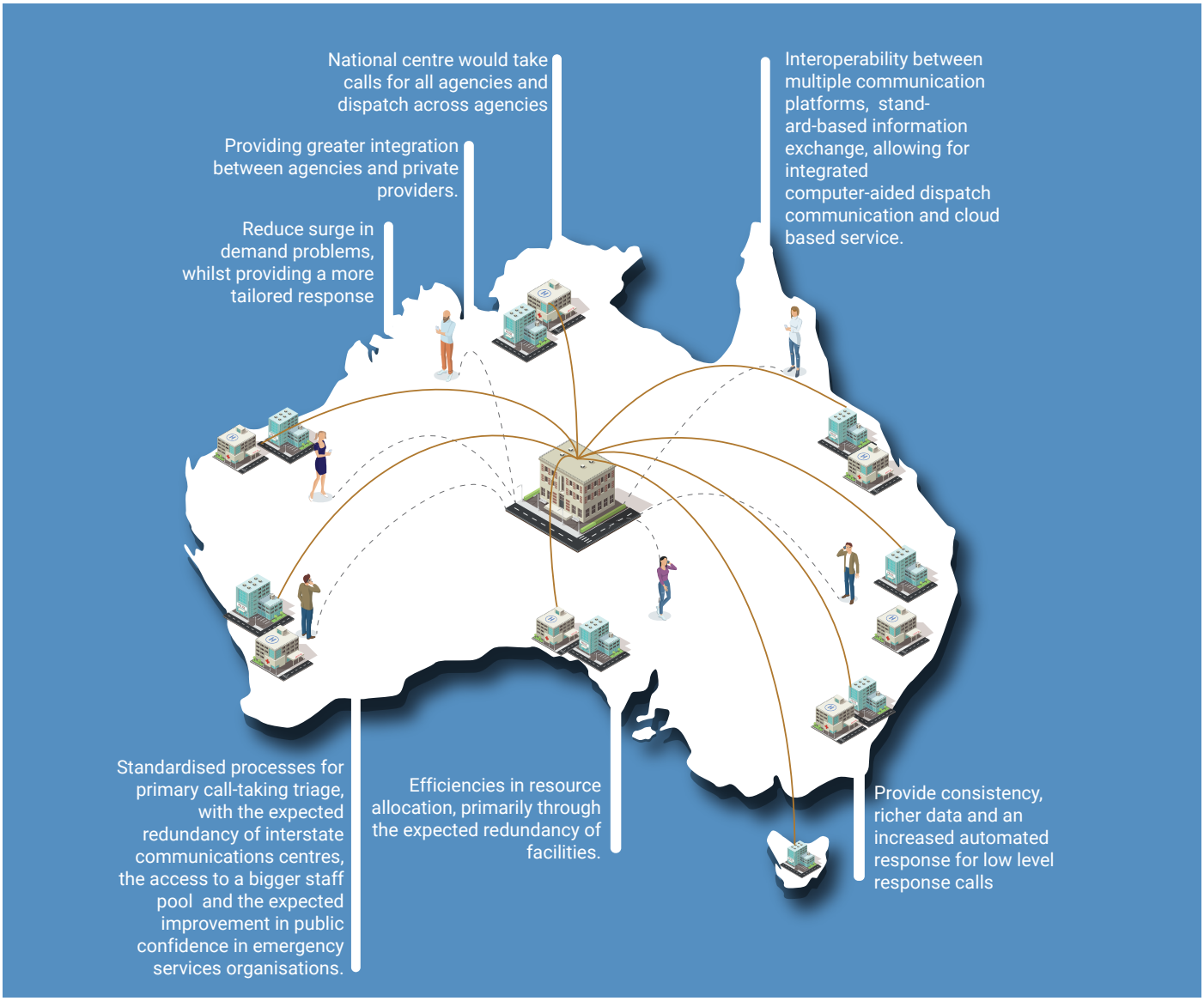


Figure 11: Centralised model

Hybrid Centralised Model (25 comments)

As indicated by some participants, a hybrid centralised model would be much like the centralised model, but with outsourcing call taking and in-house dispatching (25 comments). According to such participants, the benefits of this centralised model could be that it could reduce costs, fewer facilities would be required, it could remove industrial relations processes, it would be medium risk, and it could improve agility. This model could also help with meeting KPIs, and allow agencies to focus on core business. Other benefits would be data quality, access, sharing, and security.

However, participants also identified considerations, such as the need for standardised technologies and maintenance (5 comments). The vendor process ought to also comply with the agencies' needs.

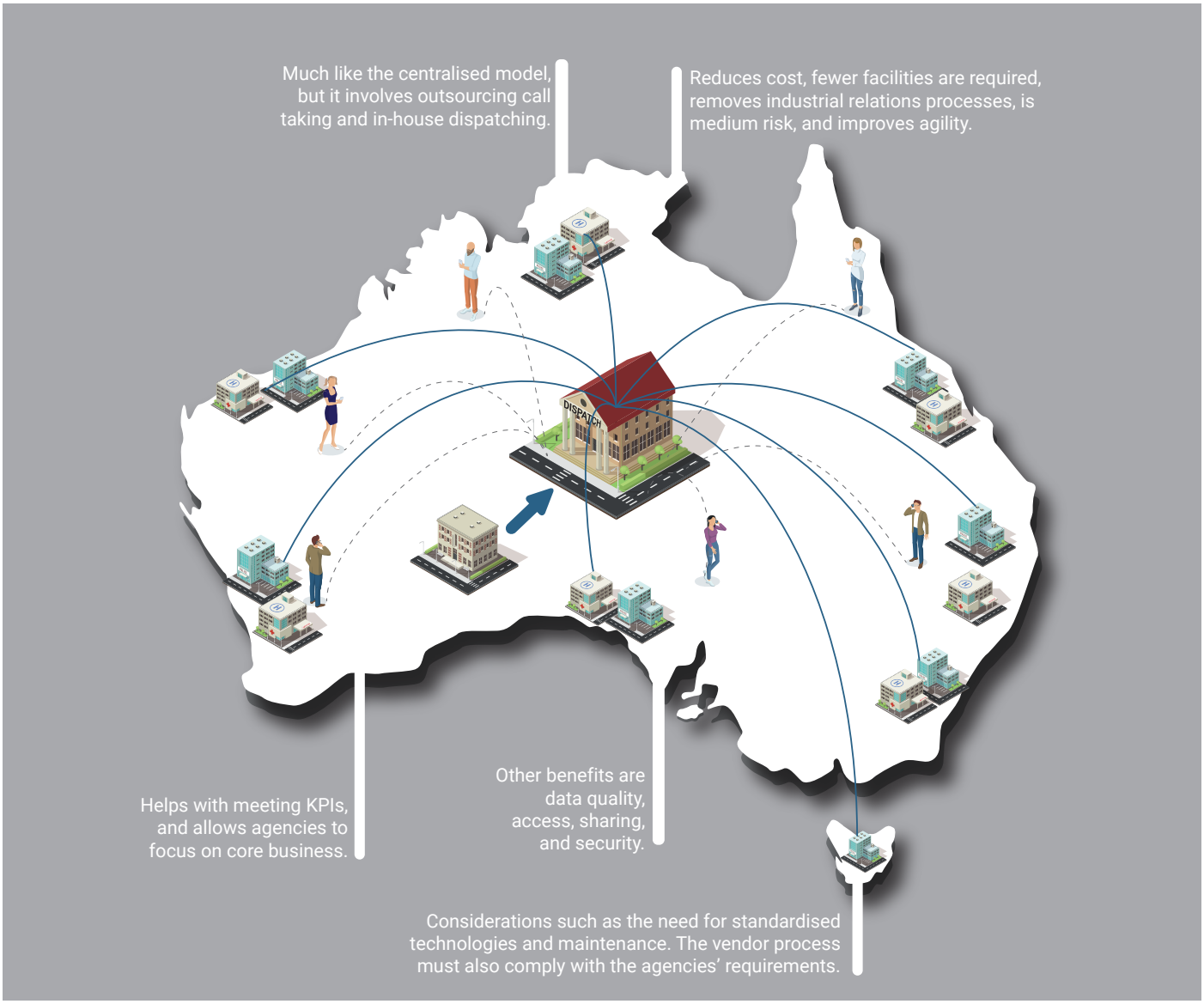


Figure 12: Hybrid Centralised Model

Outsourcing Model (25 comments)

An outsourcing model would require the outsourcing of both call centre and dispatch processes (25 comments). According to some participants, the benefits of such a model could be: less dependence on stakeholder funding, predictability and flexibility to scale up or down, allowing agencies to focus on their core business. Participants also envisaged the reduced cost of facilities, and the better quality, access, sharing and security of data. By outsourcing technology, maintenance, support and costs would move to the vendor thereby reducing costs by consolidating CADs.

However, issues to consider included the need to establish processes, and to ensure that legislative standards are met. Participants also stated that this is the highest cost and highest risk model (2 comments).

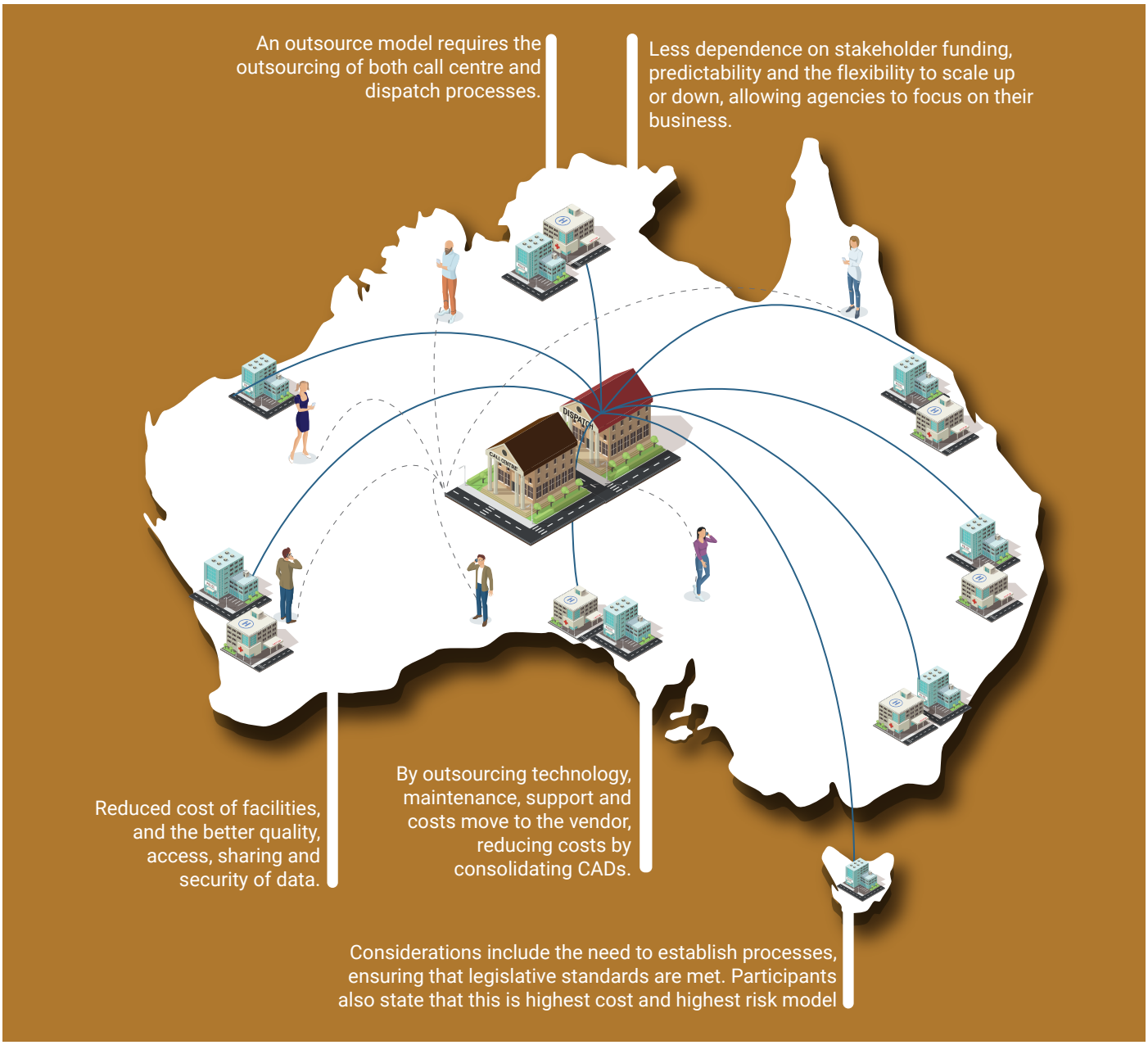


Figure 13: Outsourcing Model

Multi-Agency Decentralised Model (12 comments)

A multi-agency (decentralised) model would entail a communications centre in each state, taking calls for all agencies (12 comments). The benefit of such a model could be that communications centre staff would have local knowledge. However, according to some participants' comments, the considerations would outweigh the benefits. The issues to consider in such a model would include the requirement for more technology in each state, the need for standardised and integrated systems and processes across the states, training and staff costs, and the separate data management requirements.

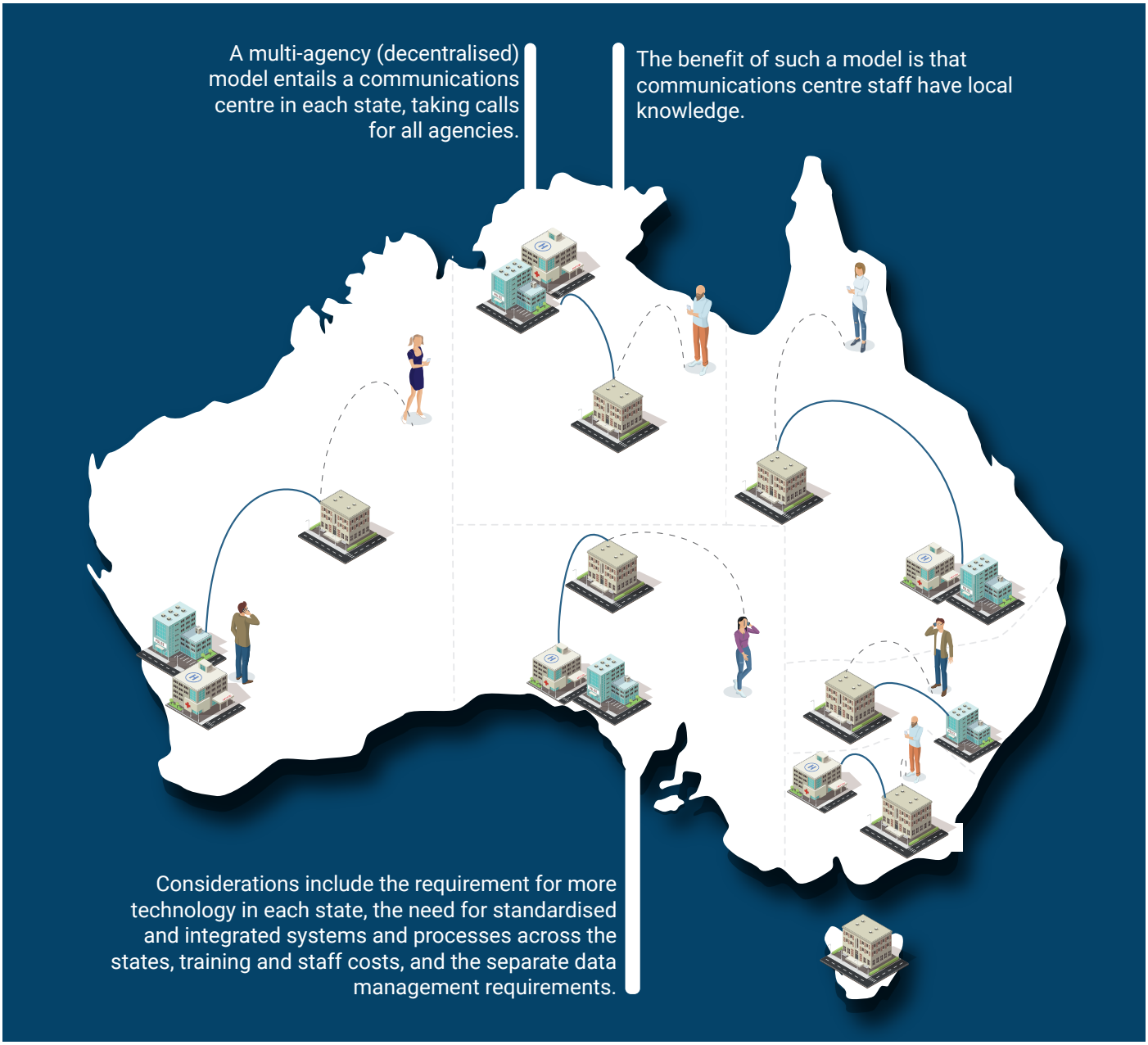


Figure 14: Multi-Agency Decentralised Model

Remote Working Model (9 comments)

A remote working model with virtual facilities would allow communications centre staff to work from home (9 comments). Technology and data would be a managed service and be cloud based. For staff, such a model could provide a flexible location and working hours. However, according to one comment, such a model would likely require rigid policy and procedures.

Enhanced Customer Model (3 comments)

An enhanced customer model would provide concierge services with high customer service (3 comments).

Total Automation Model (1 comment)

A total automation model would require people as back office IT support (1 comment).

Figure 15: Remote Working Model

Opportunities and Recommendations

The following recommendation is produced for NECWG - A/NZ to design an appropriate governance model for the ECCF. In section 6, the same recommendation is translated into a *call for action*.

- Further explore a *Centralised Call-Taking and Dispatching Centre* including governance, resourcing and regulatory options.

3.5 Activity 5 – To Do List

The final session focused on the activities required to progress on the pathway towards the ECCF. Participants proposed a set of activities that should be given priority (see Figure 17).

Figure 16: the most recurring words in Activity 5 (wordcloud)

Figure 17: To Do List

4. THE WAY AHEAD: FIVE PRIORITY AREAS

In order to summarise the findings deriving from the activities in which the workshop participants were involved, the following five priority areas were identified as worthy of special consideration for the ECCF to become reality:

1. Communication centre model attributes
2. Communication centre management responsibilities and processes
3. Government policy, legislation and regulation
4. Technology
5. Community expectations

Furthermore, in this section the practical opportunities and recommendations identified in sections 3.1 to 3.5 are translated into calls for action organised around the five priority areas.

1. Communication Centre Model Attributes

Focus on developing a futuristic call-taking and dispatching model

Participants considered the following models: a centralised call-taking and dispatch centre model; a centralised model with hybrid functions (outsourced call-taking and in-house dispatch); an outsource model with all functions outsourced; a multi-agency decentralised model; a remote working model; an enhanced customer model; and a total automation model. Based on this, the new model must meet the requirements of being agile and connected, with co-creation of services and co-design of solutions. These are the calls for action:

BE AGILE

#Evolve traditional command-and-control into an agile organisational structure

An agile governance system requires involved stakeholders to re-shape the current command-and-control organisational structure. Agility brings flexibility, customer-orientation and innovation.

CONNECT

#Bring together organisations to collaborate on crises and emergencies

A platform made by humans and technologies, the ECCF is the meeting point of emergency organisations which share their knowledge about safety and security phenomena.

CO-CREATE SERVICES

#Involve customers and vendors in the organisational fabric of emergency communication

As the 'eyes and ears' of emergency organisations in the territory, customers can provide great value to public safety. Similarly, the ECCF can leverage vendors' knowledge and capabilities to deliver high-quality, customised emergency services.

CO-DESIGN SOLUTIONS

#Join design efforts to create a centralised call-taking and dispatching centre

The different governance, resourcing and regulation arrangements are agreed upon, and co-created by the various stakeholders that characterise the ECCF. In light of the existing, fragmented models, centralisation ensures a standardised approach to emergency communication.

2. Management Responsibilities and Processes

Identify and map managerial responsibilities and processes of the ECCF

Each communication centre model should consider management responsibilities and processes. Therefore, careful evaluation of models includes management responsibilities such as emergency management, decision making, data analysis, risk management, workforce management, performance measurement and budgeting. Model evaluation should also consider how changes will benefit management decision support, improve service quality, and ultimately the reputation of the communication centre

and ESPSOs. Finally, an evaluation includes the challenges and risks of each model as they affect management processes, emergency management, privatisation, data analysis and the procurement of technology. These are the calls for action:

LEVERAGE SKILLS

#Derive the next-gen emergency communication skills from a wide range of professions

Opportunities for emergency professionals to share and upgrade their skillsets should be intensified. In the ECCF, secondments are the rule rather than the exception, and professionals constantly learn from colleagues in other organisations.

SHARE YOUR INFORMATION

#Make emergency organisations share information about their customers

Every emergency organisation knows a little about a specific customer. When these pieces of information are combined, more value for the end-users is created. This takes the form of enhanced, customised emergency services.

BUILD CAPABILITIES

#Teach the emergency communicators of the future a broad range of 'languages'

Big data analytics, artificial intelligence, robotics and design-thinking are only a few examples of the languages spoken in the ECCF. Emergency organisations have to reach out to external partners to train their workforce or capture talent from the external environment.

BE DIGITALLY INTELLIGENT

#Strategically design security and privacy in the information-sharing environment

Personal identities are not considered an after-thought in the ECCF. Their consideration is ingrained in the fabric of the next-gen emergency communication, which employs professionals dedicated to data-mapping and ethical implications.

3. Government Policy, Legislation and Regulation

"Sense" regulatory dynamics and understand how and when they could facilitate technological change

Future communication centre models must consider government policy, legislation and regulation. Government policy, legislation and regulation changes because of the need to keep up with disruptors that include climate change, competition from private emergency management organisations, and changes in funding. An evaluation of each model should reflect upon the opportunities and benefits of changes to the government's funding, the partnership between public and private organisations, their working relationships with government, service quality improvement and how changes can support government decision making and ultimately benefit the government's reputation. Finally, an evaluation of each model should consider the challenges and risks of each model to government funding, ESPSOs and government legitimacy, and technology requirements. This is the call for action:

DRIVE POLICY-MAKING

#Support regulatory change to match technological innovation and community expectations

Traditionally, technological disruptions and expanding community expectations leave governmental policies behind. The regulatory framework of the ECCF is the result of a constant lobbying effort which matches policies, technologies and service expectations.

4. Technology

Scan the environment and identify what technologies best suit the ECCF

Communication centre model evaluations must consider how each model will use technology that can provide benefits such as improved cost management, better risk management, solution agility, and engagement with ESPSOs. Model evaluation should also reflect upon the challenges and risks such as product acceptance

by stakeholders, interoperability of the technology, and the constant requirement for new technologies, along with the resources for their maintenance and upgrade. These are the calls for action:

MASTER BIG DATA

#Facilitate 'total conversation' through seamless convergence of different data sources

The ECCF is sensitive to all possible data sources. As a totally digital platform, the ECCF collects, stores and analyses digital signals which are then transformed into meaningful information for emergency organisations.

LOCATE SIGNALS

#Always capture the specific location of your digital signals

The ECCF masters Advanced Mobile Location has a default feature of the collected digital signals. Data have a name, a time and a location, which the ECCF can source anytime, anywhere to build rich information about events, customers and stakeholders.

5. Community expectations

Explore new opportunities for end users' engagement with the ECCF

The model for the ECCF must also recognise and account for community expectations. This is important because **changes in customer demographics, community expectations and perceptions of ESPSOs' performance** can threaten the relevance and viability of these services. The evaluation of the possible models should therefore assess the opportunities and benefits of each model to the community. The model needs to account for how it can partner with the public to provide closer engagement with communities during emergencies. In this way, the ESPSOs can provide a more reliable service, improve public safety, and increase community satisfaction. However, the challenges and risks of each model will also consider issues such as privacy of data, security of personal devices, public education about new technologies and procedures, and the constant need to improve the ESPSOs brand.

SENSE THE FUTURE

#Shape the design of emergency services based on the environmental dynamics

Technological, political and socio-economic trends are incorporated into emergency service creation and delivery options. As a 'rule of thumb', service design and delivery adopts the model that is the closest to the end-users.

COMMUNICATE

#Explain to your customers and stakeholders what you are doing for them

The ECCF constantly communicates with end-users and stakeholders (public and private organisations) to align expectations with service offerings. Co-designed services have better quality when seamless communication among the key partners is guaranteed.

BE CUSTOMER-DRIVEN

#Ask your customers what they would like you to do for them

The ECCF directly involves citizens in their operations, by asking them what their expectations are with regards to emergency services, by taking their feedback into account, and by leveraging their experiences and skills to co-design emergency services.

5. TRANSVERSAL THEMES

Across the different questions which shaped the reflection and discussion on the ECCF, several key transversal themes emerged as particularly relevant for the participants in the workshop: ***improved communication among stakeholders***; ***consumerisation trends***; ***improvements in reputation and increased community expectations***; ***shift in the risk management focus***; ***need for a more proactive approach***; and ***emerging human resource requirements***. The relevance of these themes is supported by the existing literature in

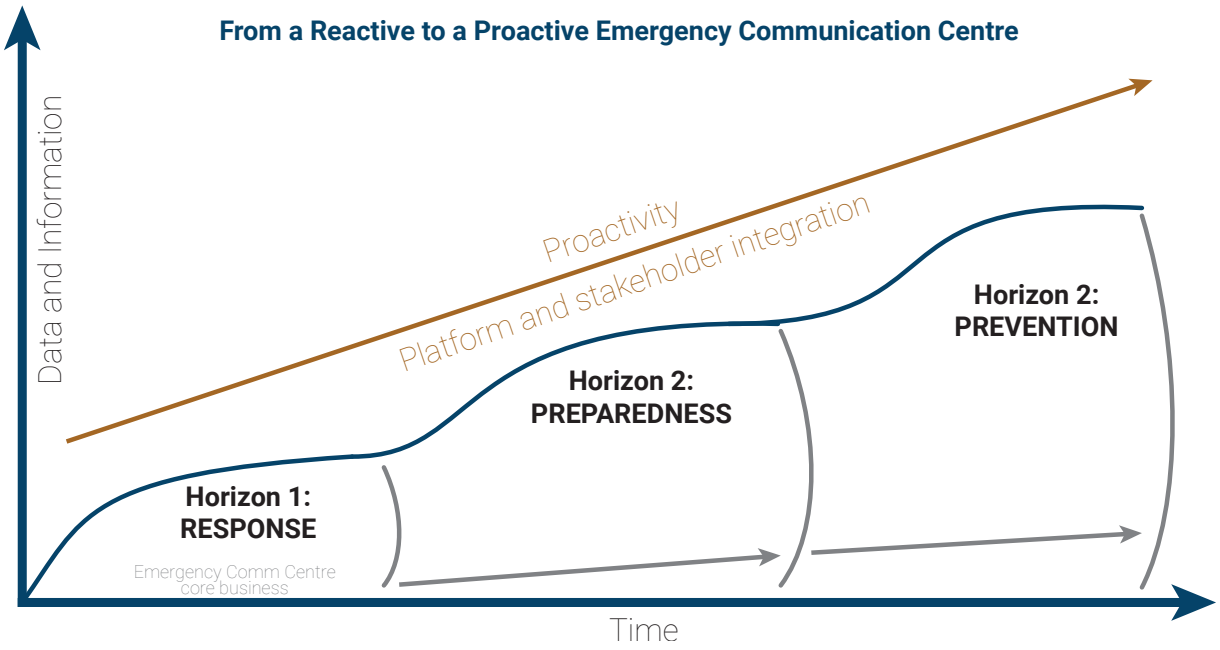


Figure 18: Three Horizons

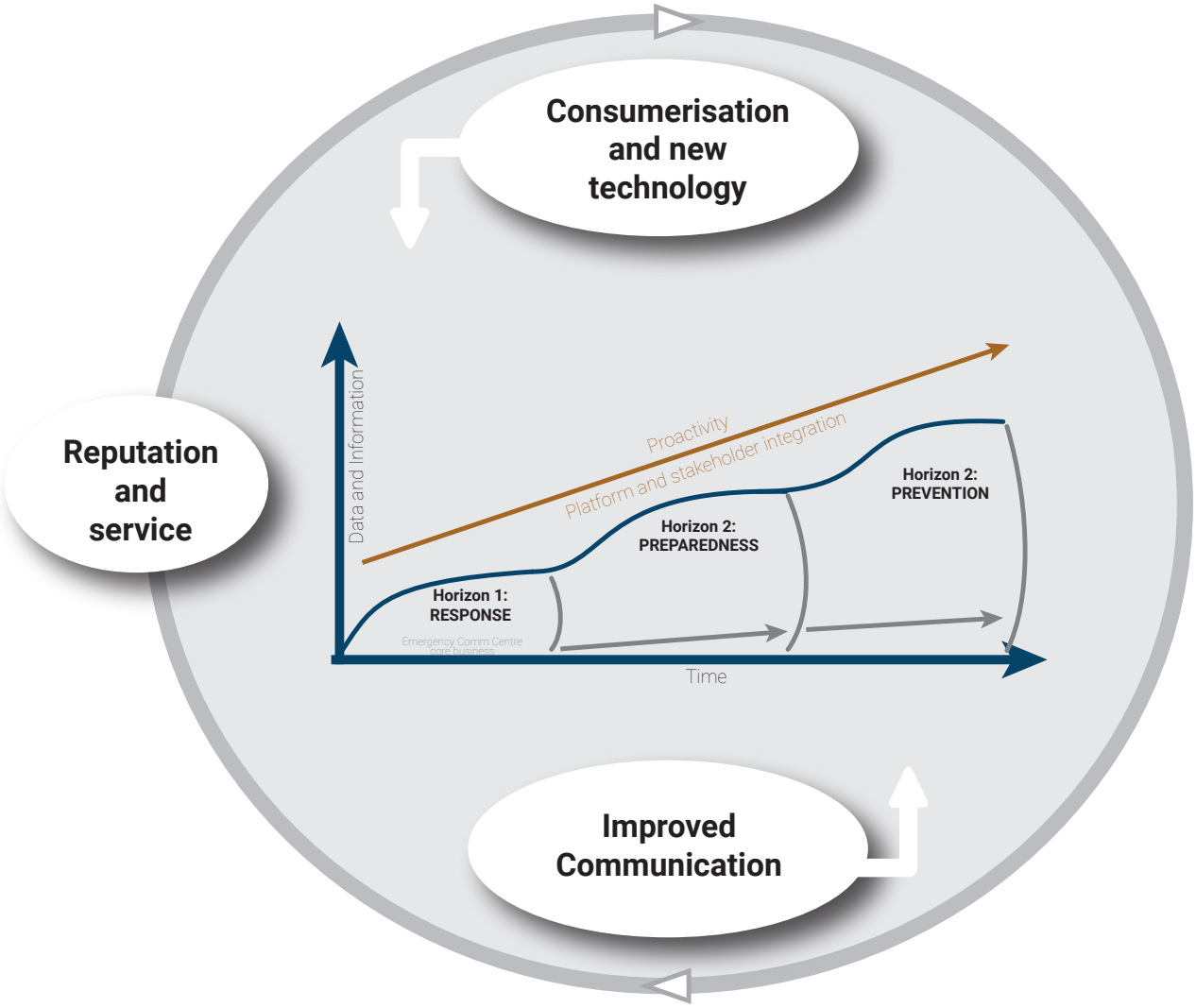


Figure 19: Three Horizons Transition Model

the respective areas, which demonstrates that further research should be conducted.

One of the main benefits from effectively establishing the ECCF is **improved communication among the different stakeholders**. In light of increased functions for the centre (not only reactive, but also proactive and possibly predictive), and a wider range of involved stakeholders (private sector, community, volunteers etc.) providing multiple sources of information on different formats, a common viewpoint is that more effective information sharing will be possible. The ECCF will likely focus on specific issues around which a range of stakeholders will converge. Putting in place appropriate channels for debate, information sharing and communication will be of utmost importance.

With the new technologies, **consumerisation,** the phenomenon that describes the impact that consumer-based technologies (e.g. social media, personal mobile phones) have on enterprise IT and the progressive adoption of such technologies in the workplace (Gartner, 2017), is acknowledged as a double-edged sword. On the one hand, it exponentially increases the availability of data, which can be collected and utilised in an agile, cost-effective way. An example of this is the possibility for citizens to swiftly upload videos from their mobile phones onto the Emergency Communication Centre website. On the other hand, this creates concerns in terms of IT security, as the expansion of the digital contact points with the citizens also increases the vulnerability of the enterprise IT architecture. Regardless of the specific judgement, consumerisation is a progressive phenomenon which will only increase in pace and require ESPSOs to adjust and embrace it.

As noted by a number of participants in the present research, the ECCF will require ESPSOs to adapt to **emerging training needs**. Operators are expected to expand their skillset and increase their knowledge of different digital platforms, a requirement which entails a deep IT education. Dispatchers will need to strengthen their technological training by interpreting and applying the massive influx of data to which they will be exposed. For example, as an emergency call is made, the system *"first identifies the caller and puts the video feed from the nearest camera on the dispatcher's main terminal"* (Mendoza, 2017), a scenario in which mastery of digital technologies seems fundamental.

From a **reputational perspective**, when ESPSOs demonstrate responsiveness to the changing technological environment, citizens' trust improves. This element is also present in relevant literature. Research conducted in four large police agencies in the US emphasised that the use of the latest technologies both increases public expectations about the capabilities of the Police and creates a favourable Police image (Koper, Lum and Willis, 2014). The fact that ESPSOs understand and utilise technologies that have become common in our daily lives is positively perceived by citizens. On the other hand, this increases people's expectations vis-à-vis ESPSOs capabilities. ESPSOs will need to effectively manage and meet such expectations, which can have very practical consequences. An example of this is the commonplace understanding that when utilising the Triple Zero (000) service, a caller's location (especially if the call comes from a mobile phone) should be automatically known by the person 'on the other side of the phone', an assumption that, as we have discussed previously, does not reflect the current situation.

From a **risk management perspective**, the ECCF will see a shift of focus in its activities. Typically, crisis and emergency management follow a multi-step approach with the following phases (Talbot and Jakeman, 2009): *prevention* is the preliminary phase, when organisations seek to reduce or eliminate the impact of potential emergencies; *preparedness* involves activities aimed at getting ready for a situation of emergency; *response* is put in place when the emergency actually occurs; finally, *recovery* is aimed at restoring the pre-crisis situation. Currently, the Emergency Communication Centres have an almost exclusive focus on the *response* phase: the caller activates the public response by ringing Triple Zero (000) and asking for help. ESPSOs receive the call through

the telecommunications carrier and dispatch their resources. The ECCF leverages the affordances of the digital technologies and progressively expands the focus of emergency operations from *response* (horizon 1), to *preparedness* (horizon 2), to *prevention* (horizon 3, see Figure 18). In an ideal future, the Centre masters data collection and builds relevant information and knowledge to *prepare for*, and then *prevent*, future crises (predictive function).

The need for a ***more proactive role for Emergency Communication Centres and ESPSOs*** and pushing information to the general public, especially in the event of a large-scale emergency, has been acknowledged by extensive literature (see, among others, Kleeman, 2015 and Battle, 2013). In this space, one recommendation insists on the need to find new methodologies for managing emergency communication in a highly-technological environment, rather than forcing existing methods into this new environment (Kleeman, 2015). On this note, recent research (Bennett, Phillips & Davis, 2016) has hypothesised that the use of wireless technologies will shape a crisis management lifecycle different to the traditional one, as previously suggested. In this new crisis scenario, a range of technologies will help ESPSOs become more proactive in their deployment capacities, to the extent that some crisis may be predicted, rather than just *responded to*. This is the case, for instance, in *geofencing applications*, *wearable technologies*, *unmanned aerial systems*, *robo-bugs*, *gesture technology*, *wireless emergency alerts* and *disaster robots*.

Interestingly, the authors analyse the powers that are meant to nurture this transformative change and identify children as potential change agents, in a process defined as *reverse socialisation*: at the household level first, where *digital natives* effectively transmit information, new ideas and technologies to older generations (Bennett, Phillips & Davis, 2016). Reverse socialisation will have practical consequences on the workforce operating in the ECCF, which will need to make vast use of digital natives by tapping into the reservoir that universities and other educational institutions have. Digital natives are considered a powerful agent for socialising the rest of the workforce in the use of the most modern digital technologies. Understandably, .this last point has implications in terms of HR management, from recruiting through to training and employer branding. Figure 19 summarises how some of the highlighted transversal themes contribute in shaping the ECCF.

6. A VISION FOR THE FUTURE: THE PROACTIVE EMERGENCY COMMUNICATION CENTRE

Innovation is best facilitated when a clear *vision* leads organisational transformation. Based on the current status, the work done by NECWG - A/NZ, the light-touch review of the literature and the findings presented in this report, the concept of ***proactive organisation*** best summarises the vision for the ECCF.

How do the seven traits of proactive organisations apply to the ECCF? Figure 20 provides some practical examples for further reflection.

7. CONCLUSION

The working environment of emergency service and public safety organisations is profoundly changing. Disruptive dynamics such as globalisation, changing community expectations and large-scale use of digital technologies are impacting the very heart of how individuals, organisations and governments deal with emergencies. These trends require from the involved stakeholders a strategic effort to re-think the ways in which they prevent, prepare for, respond to, and recover from, major safety and security disruptions. Building on the existing literature and the work conducted by NECWG-A/NZ, the present report proposes a *Proactive Emergency Communication Centre* as an evolution of current models and indicates options for the involved stakeholders to make the Emergency Communication Centre of the Future a reality.

The Proactive Emergency Communication Centre of the Future

Customer Centricity

In partnership with the ESPSOs and private companies (e.g., Apple), the ECCF has a vast amount of information about citizens' personal profiles. Upon a call to Triple Zero (000), the ECCF already knows the caller's background history and is therefore able to provide a highly customised service based on the caller's specific needs (e.g. physical health conditions, psychological state, disability).

Initiative

In a situation of major crisis, the accredited citizen is empowered to be the first contact point for the ECCF in the territory. Rather than just being considered a trigger for a service (e.g. assistance with a major car accident), the citizen is contacted by the ECCF to gain a better understanding of what the situation on the crisis scene is, and be able to promptly dispatch the necessary resources.

Data

Social media, CCTV footage, audio files, data produced by smart sensors in the territory, SMS, wireless connections, etc. all converge in the ECCF as data sources. Leveraging the capabilities of artificial intelligence the ECCF in real time, is able to elaborate such data and convert them into relevant information that dramatically expands the situational awareness around a specific area, at a specific time, even before an event occurs.

Transparency

Citizens know what the ECCF can do for them and what is beyond its scope and capabilities. A Triple Zero (000) caller knows exactly that their location will be automatically transmitted by the AML technology to the ECCF operator and that the video they just recorded on an accident's scene will be immediately received by the ECCF. Citizens know that the ECCF is the first contact point with the ESPSOs, which will be dispatched according to the specific requirements.

Trustworthiness

In order to provide its services more effectively, the ECCF stores a large amount of personal information about citizens. The process for collection, storage and usage of such information is transparent and clearly known by citizens. The ECCF goes beyond the regulatory requirements about transparency and privacy and customises such requirements to the specific citizens' needs.

Agility

There is no such thing as a typical ECCF operator. The workforce is composed of a highly diversified range of profiles: data analysts, experts in robotics, designers, technicians, experts in ethics and privacy, etc. Contracts are highly flexible to meet the workforce's needs (e.g. work-life balance). Remote working is the rule, not an exception. By leveraging the opportunities of cloud computing and virtualisation, operators can literally work from anywhere, at any time. Relevant graduate university programs allow students to explore what the typical day as an ECCF operator looks like.

Environmental Awareness

The ECCF has a number of strategic partnerships with public agencies and private companies, which enable secondments that ultimately increase the understanding of each other's business. A significant amount of time at the ECCF is dedicated to capture the weak signals coming from the external environment (e.g., the city centre, a specific suburb, the international airport) and to make sense of them. Are such signals worth further investigation? If yes, the strategic partnerships of the ECCF activate and enable the deployment of additional resources, dedicated to specific issues (e.g., tackling alcohol abuse in a specific suburb).

Figure 20: Proactive Emergency Communication Centre of the Future

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