

Flood Risk Management Prioritisation Frameworks

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Abstract

In medium to large Councils or flood management bodies, it is common a challenge to prioritise flood risk management outcomes. The need to prioritise is driven by the limited funds available for flood risk management in any organisation. As well, drivers of objectivity and transparency in decision making also play a role.

The difficulty in deriving a Flood Risk Management Prioritisation Framework stems from the need to address all of the competing objectives of flood risk management and the internal drivers of the organisation (e.g. high level policy, strategic directions, performance objectives, KPI's).

Another key challenge is due to the need to measure widely disparate criteria on a consistent and comparable basis.

Recent publications providing nationally consistent guidance on risk management has resulted in some clarity on this matter. As well, the ability to use GIS to spatially map risk now allows more objective and defensible approaches to be explored.

Jacobs has recently worked with two large flood management organisations to assist in developing prioritisation frameworks. This paper outlines the challenges faced and solutions provided.

Introduction

The need to prioritise flood risk management activities is becoming increasingly evident as floodplain management organisations have limited funds to complete flood mitigation works and reduce flood impacts throughout their jurisdictions.

In recent years, Australia has seen wide-scale flooding, particularly along the east coast. This has increased the need for decisions to be transparent within the flood management organisation and to the community and other stakeholders. This transparency is also often used as a justification for funds allocation or for prioritising one community's flood mitigation works over another's.

Many new guidelines have become available which outline various flood risk management decision approaches, many of which include a risk based approach. However, few of these guidelines include direction on prioritisation of these risks.

Three of the recent publications include:

- Floodplain management in Australia: a guide to best practice in flood risk management in Australia (EMA 2013)
- National emergency risk assessment guidelines (NERAG) (NEMC 2010),
- ISO 31000:2009 Risk Management – principles and guidelines (International Organization for Standardization 2009).

This paper focuses on the reasons to prioritise flood risk management works and how to achieve a robust and relevant prioritisation framework.

The Process: why prioritise

Many organisations that are charged with the responsibility to manage flood risks are often confronted with the challenge of deciding where to place focus. The development of a prioritisation framework can enable an organisation to compare different areas / approaches / options in a consistent manner. The end result of any successful prioritisation framework is that the organisation has better vision of where it should focus its efforts.

Hence, there are a number of drivers to prioritise:

- 1) Demonstration that funds are being focussed on the appropriate areas / strategies
- 2) Demonstration of consistency in decision making
- 3) Demonstration of alignment with organisational strategy
- 4) Building of support within organisation for direction

Each of these drivers is discussed below.

Funds Allocation

Funds are always limited in such organisations. Hence, one of the main drivers behind the development of a prioritisation framework is to identify the most useful way to spend limited funds.

Funding sources need to be understood from the perspective of their life span (how long do the funds exist), the funding dollars available per annum and over the life span of the funding and any conditions surrounding the funding.

Demonstrating Fairness

In directing where to focus efforts, an organisation needs to demonstrate fairness in the process. This can be especially relevant where the community has visibility of the efforts. This is often the case in flood risk management as the ultimate outcomes of implementing strategy can usually be seen by the community. This can often raise questions amongst members of the community regarding the reasons for certain areas or strategies being favoured over others.

With the potential for the public to derive linkages between politics to strategic direction, there is a strong driver for organisations to demonstrate in a clear and robust manner that decisions and priorities have been determined without political interference.

While the details of the prioritisation may not be made public, provision of a framework (or summarised elements) can go some way to convincing members of the community that a consistent process has been followed. In general, this is what most members of the public wish to see – that a sensible, fair and consistent process has been followed without interference.

A consistent framework and approach also provides justification to independent bodies undertaking audits of funding allocation or post flood enquires.

Demonstrating Organisational Alignment and Building Support for Direction

Often organisations spend considerable effort in defining the goals and aspirations in regard to flood risk management. These goals are usually linked to an over-arching mission statement of the organisation.

While it is important that these missions and goals are well-defined, it is just as important that they be considered in the implementation of strategy. In that regard, a prioritisation framework should ideally demonstrate strong linkages between the organisational goals and the tools used to prioritise.

The reasons for demonstrating this alignment are two-fold. Firstly, it reinforces the goals as being valid and useful in guiding the decision making process. It is worth asking the question over and over again at relevant junctions in flood risk management – *“does this effort help achieve the overall aims of the organisation ?”*.

Secondly, the alignment helps achieve organisational unity. If all parts of the organisation direct efforts with the same goals in mind, it is highly likely that these efforts would be complimentary across the organisation. Hence, the process of using the goals as a structure for prioritisation will help in reinforcing the value of these goals throughout the organisation.

Challenges: “can’t be that hard”

Stakeholder Buy-in and Organisational Alignment

Aligning the prioritisation framework to the organisation’s strategic direction is important to ensure organisation buy-in and adoption. This alignment could be through linkage to existing policies, procedures or requirements, or as simple as aligning to existing processes.

The buy-in of the organisation as a whole is just as important as the buy-in of all individual users and internal stakeholders. Through alignment to existing policies and procedures, ‘selling’ a new prioritisation framework to users and managers is made easier rather than creating a framework which contradicts existing policies and procedures.

Some examples of alignment are to other existing frameworks and strategies. Similarly, alignment with findings from an enquiry which place actions on the organisation will reduce the effort in creating organisational buy-in.

Simplicity and Repeatability

The prioritisation framework needs to be simple and repeatable. Simplicity includes the time and effort to populate the framework, including additional processes required to obtain data for input. A tool in which there is little ambiguity about the input creates a simple and repeatable tool. This can be achieved primarily through using inputs which are quantitative, not qualitative and, furthermore, using quantitative inputs which have an agreed scale of importance or severity.

Reducing qualitative inputs will increase the repeatability. Instilling clear and detailed user instructions will also increase repeatability.

Linkage to Adopted Guidance

As mentioned previously, there are primarily three documents which discuss risk based approaches to floodplain management (EMA 2013; NEMC 2010; and International Organization of Standardization 2009). It is important to align as many aspects of the prioritisation framework to these documents and any other further documentation released on best practice flood risk management and prioritisation.

The update of Australian Rainfall and Runoff is in progress, with many draft reports available (ARR 2013). This is another important document which will guide flood risk management, and should be considered fully at its release.

Availability of Data for Input

Much of the information and data required to populate a prioritisation framework will be readily available by the flood management organisation. It is important to develop a framework that incorporates information that is readily available for all areas of interest, both now and into the future.

A consistent format of the input data is important, particularly when the data forms part of a corporate dataset. This is because the processes which incorporate that information into the prioritisation framework will require a consistent format and will otherwise need to be updated as input data formats are updated.

Engagement of Stakeholders

A clear understanding of all the stakeholders, both internal and external to the flood risk management organisation, will ensure that all their needs are incorporated into the prioritisation framework. It could be that, although the ultimate outcome is consistent, the detail required by different groups within the organisation is different, or that they require different aspects of the framework outputs. This could relate to types of flooding being managed, or whether the stakeholder is concerned about the cost and ongoing financial implications of a proposed scheme or the reduced number of houses impacted.

In the development of a prioritisation framework the nature of involvement of each of these stakeholders during the development phase needs to be carefully considered. Involvement could range from workshops to an email advising of the system to be adopted. We have found that workshops in which the platform, criteria, data requirements and all aspects of the framework are agreed and fleshed out are the best form of engagement during the framework development phase.

Recognise the range of flooding sources

Flooding can result from many sources of flooding, including riverine, coastal, drainage and resulting overland flow. The prioritisation framework needs to assess the intricacies of each flood type, such as frequency of flooding by incorporating a range of modelled events, impact to community by assessing whether it be frequent nuisance flooding, or infrequent flooding causing wide spread damage. This comparison will allow for different flood types to be compared as the flood risk management organisation is likely to have a finite funding source, regardless of the flooding type.

Application to Flood Risk Management

Much of above applies to any organisation trying to prioritise efforts in a direction, whether related to flood risk management or not. Specific applications to flood risk management include:

- Prioritising areas or locations for flood risk management focus
- Prioritising flood risk mitigation measures
- Prioritising flood events to manage

Each of these applications is described in further detail below.

Location prioritisation

An organisations jurisdiction is likely to incorporate many towns or discrete areas in which flood mitigation works could be undertaken. The flood risk at each of these locations will vary, and also the acceptance of the community to undertake works in their area.

A prioritisation framework will allow for each area to be assessed on its own risks and merits and then compared to other areas. This type of comparison will typically be undertaken on existing conditions, without flood mitigation measures to assess where the most severe risk exists and which town should be assessed for flood mitigation measures.

Flood risk management measurement prioritisation

There is a wide range of flood risk management measures that can be considered from structural options such as channel clearing, culvert re-sizing or flood levees to non-structural options such as flood warning systems, and community education.

Any of these options can reduce risk. However, comparing non-structural measures against structural measures presents a number of challenges (costs vary by orders of magnitude, areas of benefit vary significantly, life-span and maintenance costs also vary).

Each option can be assessed in the prioritisation framework to determine the most appropriate option or combination of options to mitigate a particular flood risk. There are a number of alternatives for assessing these flood risk management measures on a consistent basis and these are discussed further on in this paper.

Flood event prioritisation

A variety of floods can cause impacts to a particular location, ranging from the frequent events such as the 10% AEP events to rarer events such as the 0.5% AEP events. A good quality prioritisation framework will be able to assess which events should be addressed to reduce the overall risk to the community. This could include a benefit-cost assessment over the life cycle of the option(s).

The community may also accept major flooding that occurs on rare occasions, but not frequent flooding which closes roads and block access annually. This community direction should be included in the event prioritisation.

Solutions: the do's and don'ts

Consider Options

At the outset of developing a prioritisation framework, it is important to consider the options available. Not all organisations will have the same needs and drivers. Hence, the choice of structure for a prioritisation framework needs to recognise these drivers, the constraints facing the organisation and then chose an appropriate structure.

Essentially, there is a spectrum of options from community-based processes that would be relatively qualitative in nature through to a highly quantitative monetary assessment where all parameters of an option are given a monetary value.

Table 1 below presents this spectrum and identifies some of the key pros and cons for each option.

Table 1: Comparison of Different Approaches to a Prioritisation Framework

Option A: Community Based Forum		Option B: Multi-Criteria Analysis / Multi-Objective Analysis		Option C: Monetary Assessment	
<i>Pros</i>	<i>Cons</i>	<i>Pros</i>	<i>Cons</i>	<i>Pros</i>	<i>Cons</i>
Defendable as it is the 'decision of the people'	High confidentiality issues	Defendable	Some subjective measures	Highly defendable	Hard to turn some parameters into a monetary value
Has basis in community consensus	Not overly consistent / repeatable	Flexible / Scalable	High data requirements	Easy to compare as \$ vs \$	Could be challenged on issue identified above
Increases community engagement in FRM	Community may not understand complex technical issues	Generally repeatable	Can be difficult to understand process	Repeatable	Very high data requirements
Community can have input into options	Group of people may not be representative	Can link back to organisational principles	Objectives / criteria need weighting	Can easily link to other frameworks as consistent basis	Non-tangible benefits usually under-valued

Choice of Platform

One of the key elements to any successful prioritisation framework is ease-of-use. This element needs careful consideration in the choice of platform. A poor choice of platform can considerably shorten the life of the prioritisation framework and reduce its effectiveness.

Ideally, the platform chosen needs to be widely used by and familiar to most potential users. Hence, bespoke software with specific interfaces will usually result in a prioritisation framework with a short life.

It also needs to be recognised that the prioritisation framework will need to adapt to organisational changes, technology developments and user needs over time. Hence, the ability to alter, improve and adapt the prioritisation framework easily is key to its longevity.

For many of the reasons listed above, a tool such as a spreadsheet provides an ideal platform for the development of a prioritisation framework.

Figures 1 and 2 below show examples of the types of outputs possible from a simple MS Excel spreadsheet. Highly flexible platforms, such as spreadsheets, allow tailoring to an organisation's needs.

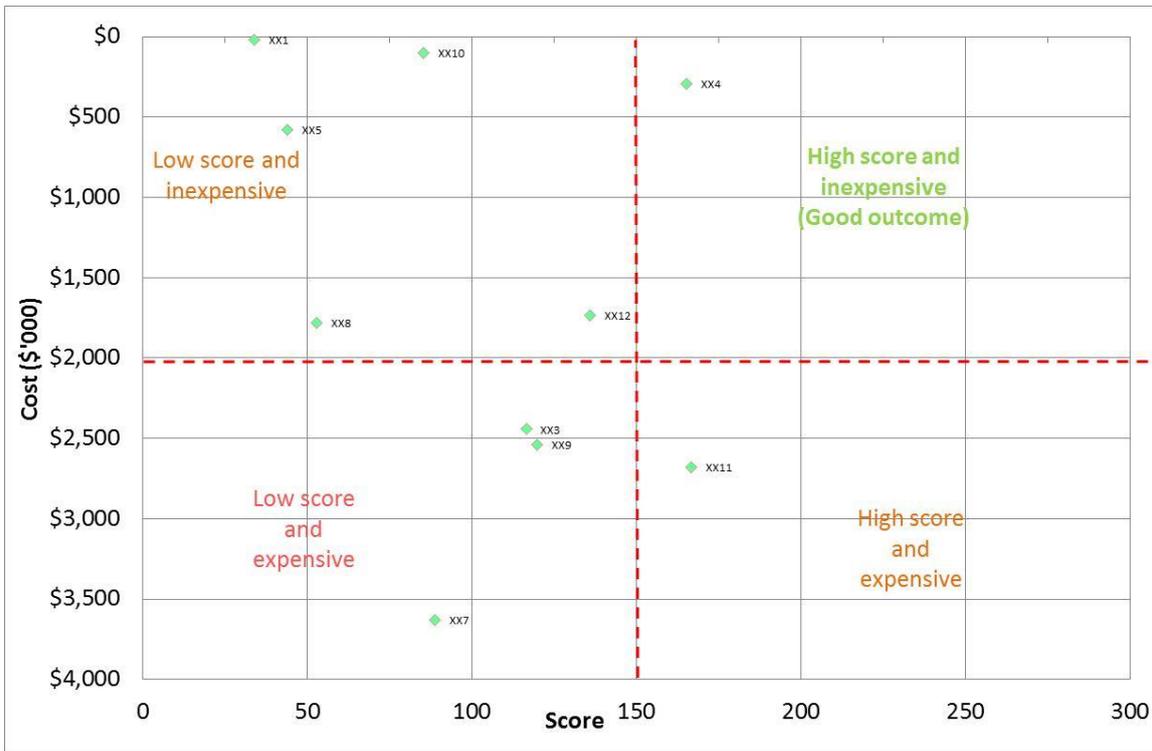


Figure 1: Example Outputs of Cost vs Prioritisation Framework Score in MS Excel

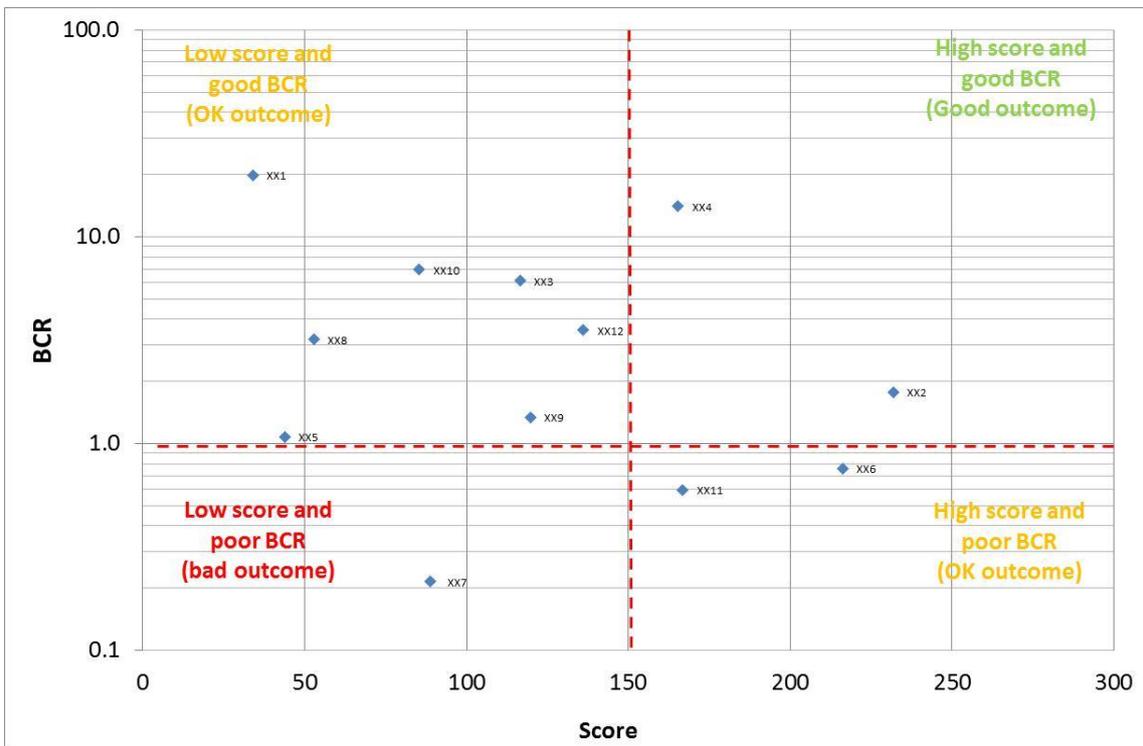


Figure 2: Example Outputs of BCR vs Prioritisation Framework Score in MS Excel

GIS tools can also be used. These provide the opportunity to spatially represent flood risk management measures or areas of focus. However, the somewhat limited abilities of GIS in data entry and comparative analysis would need to be considered against the possibly lower priority objective of presenting the outcomes spatially.

GIS platforms form powerful data processing mechanisms, particularly as organisations store increasing amounts of data in GIS format. Tools can be developed to increase efficiencies in populating the prioritisation framework in another platform such as a spreadsheet. Outcomes from a more flexible platform could also be developed into a format easily input into a GIS platform for final presentation and long term storage of data.

Structure

As discussed above, it is important to structure the prioritisation framework such that the organisation’s principles are used as the basis that supports the remaining elements. Figure 3 shows an example structure where principles are strongly linked (sometimes with multiple linkages) to objectives. These objectives can then be scored based on numerous individual criteria.

By creating a structure such as the one below, there is a clear linkage demonstrated throughout the framework back to key principles. As well, it allows a check-in for objectives and criteria that do not fit into the organisation’s principles.

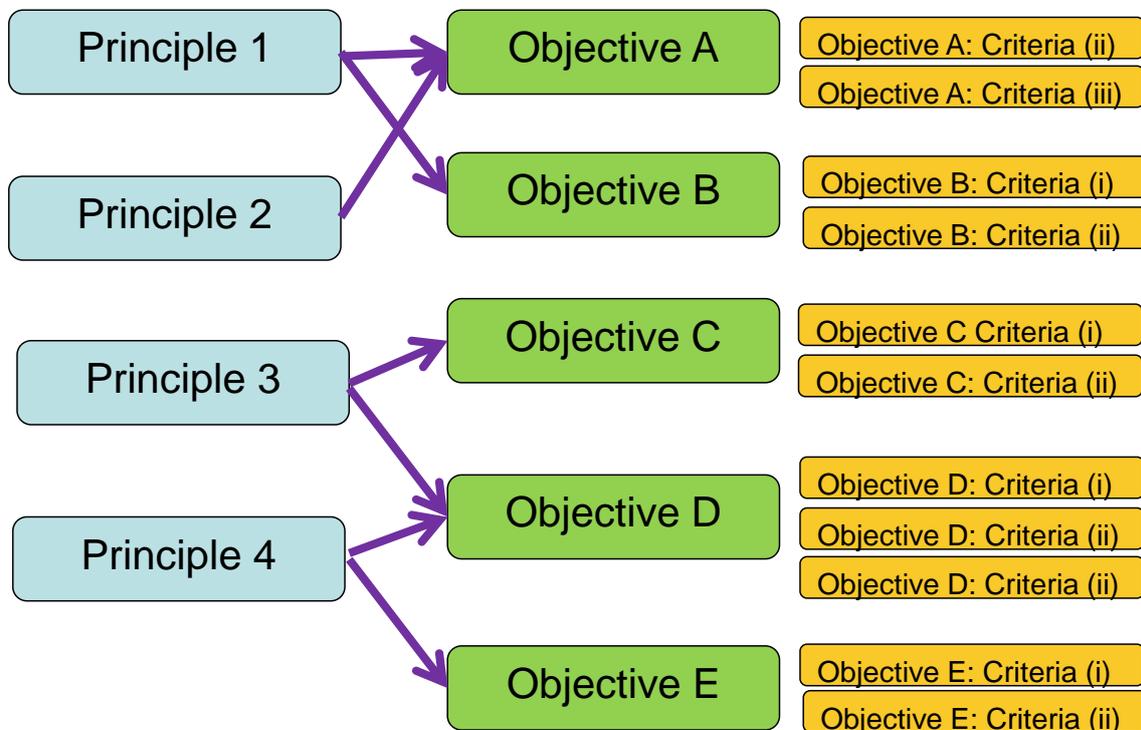


Figure 3: Example of Linkages between Organisation Principles and Objectives / Criteria

Maintenance and Ongoing Development to Extend Life

The ongoing relevance and function of a prioritisation framework is critical, and this can be achieved through periodic reviews of the framework. The appointment of an appropriate champion within the organisation will maintain the relevance and be responsible for the prioritisation framework.

The champion’s role and key attributes would ideally include:

- Maintaining user documentation
- Ensuring all users are adopting the correct methodology, and one which is consistent across all users

- Maintaining an issues log which includes opportunities for improvement
- Facilitating users meetings to discuss innovations adopted by individual users that could be adopted by all users or that could improve methodology.
- Being the key contact for all users and stakeholders
- Being an individual within the organisation that can drive change and positively influence users and stakeholders
- Being a framework users and / or fully understands the methods to update the framework
- Being responsible for or have a strong involvement in flood risk management decisions

These roles and attributes are further described below.

Maintaining documentation: A User Manual should be maintained which incorporates methodology, template location, documentation of all users and their experience levels, required reviews and reviewers, sources of input data; and usable outputs.

Maintenance of user documentation allows for any new or existing user to refer to a consistent set of documentation; this also allows for independent reviews or auditors to assess the methodology and processes and ensure that all users are adopting consistent methodologies.

An issues log should be kept in a centralised location on the organisations network and allow for all users to input issues as they arise. Issues could arise due to application in an area with specific attributes which make it difficult to populate the existing prioritisation framework, improved input data sources or methodology requirements or changing legislation or organisation requirements. The issues log should include identification of the user who entered the issue. The issues log should be reviewed periodically to ensure that the prioritisation framework is meeting all user needs and producing the best available and most defensible prioritisation.

Driving stakeholder involvement and consistency: In order to drive stakeholder involvement, the champion should be well known within the organisation and particularly the user group. The champion should also have a positively influential personality with some experience in stakeholder management and involvement.

Inconsistency in the adoption of prioritisation framework could open the organisation to criticism. Encouraging all users to adopt the methodology outlined in the user documentation will reduce this potential.

The best way to achieve consistency is to get buy-in from all users through regular meetings which discuss improvements and framework methodology. These meetings should also be used to discuss the issues log and any innovations identified by users.

Owning the framework: The champion should be an individual within the organisation who has a key role in managing flood risks and also has a good understanding of both how the framework is populated, the input information and its ultimate application and required outputs.

The champion will need to facilitate ongoing funding to ensure its maintenance and review to ensure currency and relevance.

Conclusions

Prioritisation of flood risks and flood risk management measures is becoming increasingly important and relevant to flood risk managers due to limited funds for flood mitigation measures and increased stakeholder enquiry regarding decisions for investment in flood mitigation measures.

Many flood risk managers will have adopted some mechanism for prioritising flood risk management measures. However, this may be an informal approach with varying degrees of documentation. The establishment of a robust and defensible prioritisation framework will assist in consistent decisions that are well documented and can be communicated to all stakeholders.

Key challenges in the establishment of a prioritisation framework include the alignment to the organisations strategic direction, policies and requirement and alignment to the needs of all stakeholders.

To assist in adoption, the established framework should be simple and repeatable – reducing the effort required to populate the framework and reducing any inconsistencies that might arise between framework users. Data inputs should only include readily available data that is unlikely to change in its availability and across the organisations jurisdiction.

A prioritisation framework can be adopted to prioritise locations for flood risk management measures within an organisation's jurisdiction, which measure is most appropriate for adoption and which flood events should be addressed by the measure.

In the development of a prioritisation framework, the options to meet the organisation's requirements need to be identified. The chosen structure should include a platform that is readily available to all uses within the organisation, and encourages easy input, use and output of results.

Consideration of the overall structure of the framework and how it links to other requirements and tools developed by the organisation is important.

Finally, for ongoing relevance and function of the framework a champion should be appointed who will maintain documentation, and ensure consistency between stakeholders.

References

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