ALIGNING FORCE PLANNING AND SYSTEMS ACQUISITION

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ABSTRACT

With the dawn of democracy in South Africa, there was a general shift in paradigm in the utilisation of the defence force. The formation of Joint Operations Division signalled a new era for the SANDF and a drive towards jointness in operations, which meant joint planning for the future. Acquisition in the SANDF is governed by Defence Acquisition Policy (DAP) 1000 based on sound System Engineering principles. This policy defines eight levels of the system hierarchy. This is important to distinguish between the various levels of employment and complexity. This study focusses on the interface between systems levels 5, 6 and 7.

The ROC is drafted by arms of services with Joint Operations division (which specifies capability requirements) only involved in its approval process. This in turn creates a gap between force planning and acquisition of product systems. In assessing the alignment of future defence objectives and prospective acquisition programs, the efforts to assess this gap has four areas to deal with, namely, implementation of Capability-based planning (CBP), assessment of the link between capability requirements and acquisition programs, the link between technology planning and capability development and lastly the engineering concept required to take over from System of System Engineering from Level 7. Survey and case study methods were used for this research to assess whether there exists a gap between capability development and systems engineering as it is done in the SANDF and devise proposals to deal with the gap should it be found to exist.

Key words: capability, Systems Engineering, Capability development, Force Planning.

INTRODUCTION

The changing environment in the 21st century dictates more innovative means of developing capabilities for the future. While the planning for future capabilities is underway, it is important to ensure that the developments stay abreast with the changing technological environment. Many organisations do not have the luxury to acquire new and latest technologies, and to remain on the leading edge of technology, hence there is a need to devise innovative means to develop and manage technologies.

The South African National Defence Force (SANDF) faces a challenge of determining its future capability requirements, as a result also ensure that they can innovatively manage related technologies. The military is a highly technological environment, and the ever-changing nature of warfare has proved to accelerate technology developments so much that most of the world armies are unable to cope within their specific financial means.

There exists a significant gap between capability planning and acquisition of product systems in the SANDF. More often the two processes do not overlap correctly, or there is often reluctance to integrate systems engineering at the higher levels, and is the capability development only restricted to higher levels. The correct mapping of the two, is key to achieving the most effective and efficient solution of defence capabilities. There have been strides and significant progress and attempting to integrate Systems engineering at the highest levels, by introduction of the 'System of Systems" concept.

CONCEPT OF CAPABILITY DEVELOPMENT

Capability means the ability to do or affect something. This term can refer to capacity or ability. In the context of the South African National Defence Force (SANDF) the term is normally used to refer to equipment. In the context of this report, and the Directorate Capability Development, which is responsible for future force planning and developing proposals for Future Force Design for the SANDF, 'capability' means the capacity or ability of the SANDF to achieve a particular operational effect. The operational effect may be defined in terms of the nature of the effect and of how, when, where, and for how long it is produced. For the purpose of this report, this definition of capability is adopted.

SYSTEMS ENGINEERING

The application of disciplined Systems Engineering has been proven to significantly improve program performance especially on complex systems. (Kossiakoff et al, 2011). This fact is particularly important for SANDF projects which are often large scale and complex. The benefits of systems engineering are realized by prioritizing work efforts based on the highest return on investment. One key step to success is for an organization to benchmark their own Systems Engineering capability, identify gaps, and plan to improve. Hence the integration of Force planning based on CBP and acquisition (DAP 1000) based on SE principles is important. Traditional SE Approaches are often not sufficient to tackle increasingly large-scale complex systems. Hence the SE community is paying increasing attention to issues of Systems of Systems, complex systems, and enterprise systems. Increased system complexity warrants increased systems engineering capabilities.

RESEARCH PROBLEM

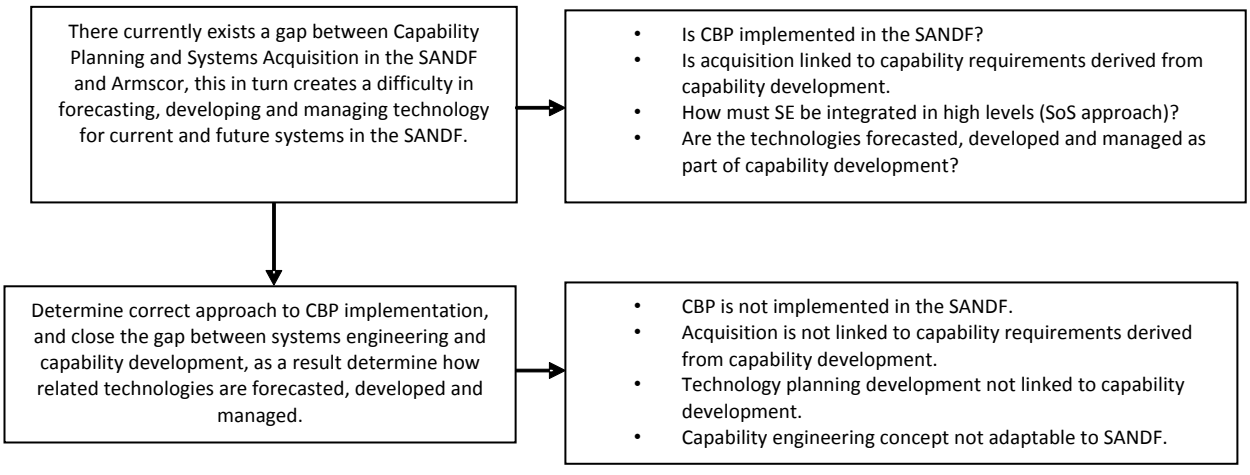


Figure 1: Research problem statement and objectives

SED MODEL OR CONCEPTUAL METHOD

The CBP and SE approaches all seek to satisfy the customer need in a most cost effective way. The implementation of CBP is in its infant stages in the SANDF. The successful implementation should be followed by defining the interface between Future Force Planning and Acquisition of the solutions.

CAPABILITY DEVELOPMENT PROCESS

Figure 2 shows the generic CBP approach. CBP process may differ from one to another due to the differences in structure and other organisational dynamics. For the Implementation of CBP to be successful, the buy-in from all stakeholders is required.

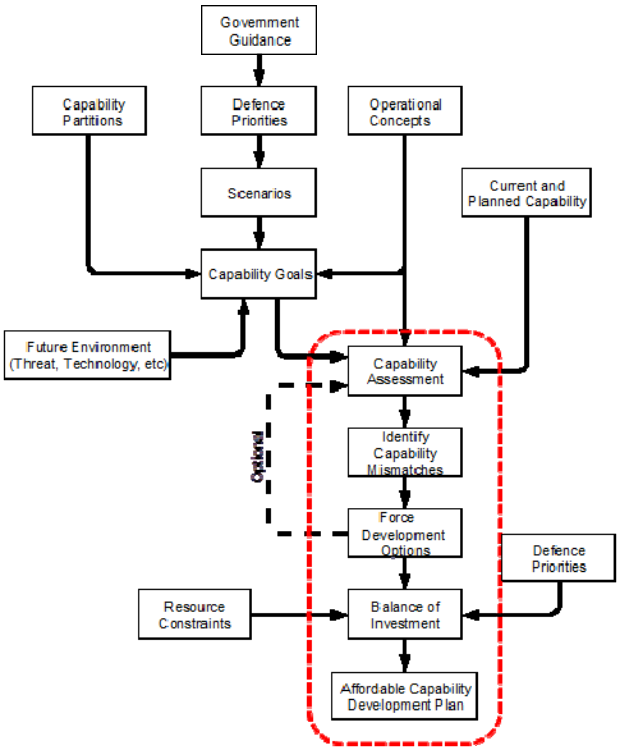


Figure 2: Generic Process Chart of CBP(Source: Guide to Capability-Based Planning)

SANDF SITUATION

DAP 1000, states, prioritises and specifies the capabilities required in terms of equipment, facilities and services to fulfil the SANDF's specified obligations, roles, functions and tasks. The Services participate in these need statements and in the various acquisition planning and approval forums in order to execute their task of preparing and providing forces to C SANDF. (DAP 1000 ACQ No 00005/2003, Edition 3).

The efforts of CBP in the SANDF are centralised around the requirement of joint capabilities. The J Ops Division is responsible to coordinate joint operations for the SANDF. The SANDF capability portfolios are structured as follows (DEIS Master Plan, ver 1)

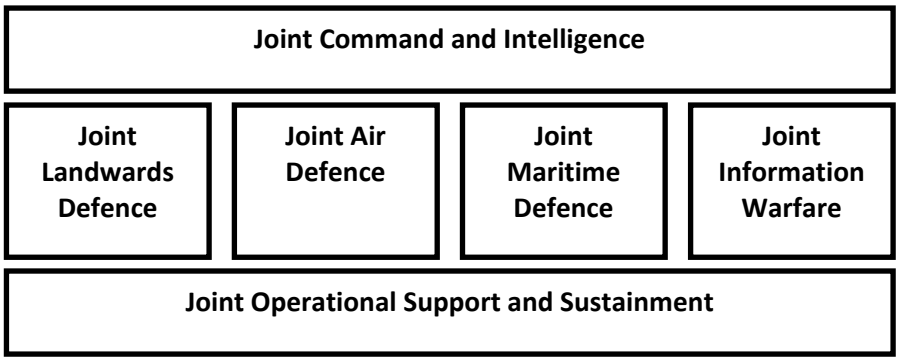


Figure 3: SANDF Capability Portfolios (Source: DS/DEISMD/R/516/B.2010. DoD Information Strategy)

SYSTEM OF SYSTEMS ENGINEERING CONCEPT

SoS Engineering is defined by the US Scientific Advisory Board as "the process of planning, analyzing, organizing, and integrating the capabilities of a mix of existing and new systems into a SoS capability that is greater than the sum of the capabilities of the constituent parts. This process emphasizes the process of discovering, developing, and implementing standards that promote interoperability among systems developed via different sponsorship, management, and primary acquisition processes. This concept is critical in the transition between capability planning and Acquisition process in the SANDF.

CAPABILITY ENGINEERING

The aim of the CE concept is to bridge this gap, between capability development and the acquisition of new capabilities. This approach is to improve decision making, by reducing the uncertainty of planning for the extended long term, and ensure efficient strategic investment. The intent of this concept is to implement a systematic link between the conceptualization of a capability and the detailed definition and design of the component systems that enable that capability.

Lizotte et al (2005:15) argues that the application of CE requires a process, supporting tools, and personnel with the skill sets to employ this process and tools. The best source for processes and tools at this time is the SE domain, whereby the community has standardized processes and are actively using and enhancing tools in the area of requirements management, functional modelling, architecture modelling, use case definition, Computer Aided Design and Drafting (CADD), human form and behaviour modelling, life cycle cost modelling, and both constructive and virtual simulation.

CAPABILITY ROAD MAPPING

The interface between Capability Development (Force Planning) and the Acquisition process (DAP 1000) would be defined more elaborately by the Capability Roadmap. As mentioned previously, a capability could be the integration of many existing systems. These systems can be at different phases of their life cycle. Figure 4 shows an example of a capability built on many existing systems. (Lizotte et al 2005:13).

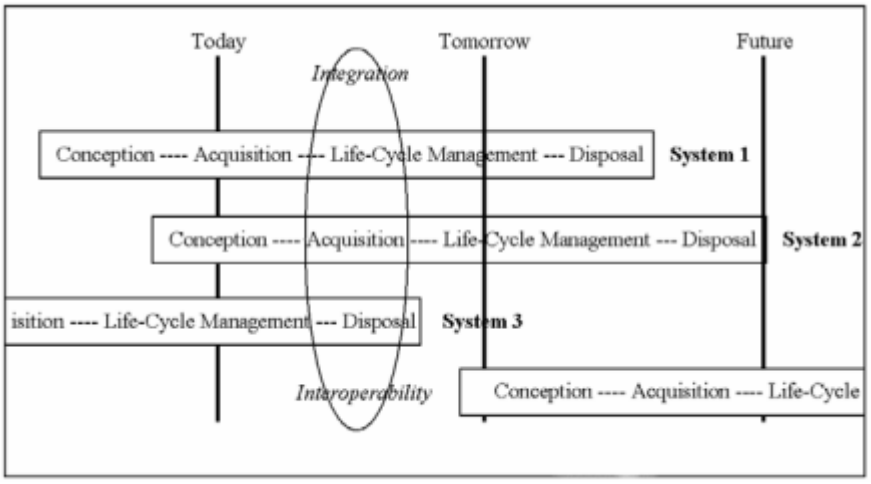


Figure 4: Systems and Capability Management (Source: CapDEM Toward a capability engineering process)

The Concept of SoS engineering has been discussed as a way of advancing and establishing CE concept. The SoS emphasizes the involvement of Human interaction, which is key in achieving required results. SoS engineering emphasizes the process of discovering, developing and implementing standards that promote interoperability among systems. This is complementing the CBP and would help define how CBP should then interface with Acquisition of capabilities.

CE has also been identified to aid in providing a process that will bridge the gap between CBP and SE. The implementation of CBP in the SANDF may have problems that may require a dramatic shift in the stove pipe approach currently used. The acquisition process (DAP1000) may need to be revised to compliment CBP.

RESEARCH METHODOLOGY

The transition area to be investigated is indicated by a dotted line in Figure 5. In this area, the following are to be investigated:

a. The implementation of CBP in the SANDF.

b. The linkage between capability development process and the acquisition process.

c. Whether technology development is linked to capability development.

d. Whether CE concept is adaptable for the SANDF.

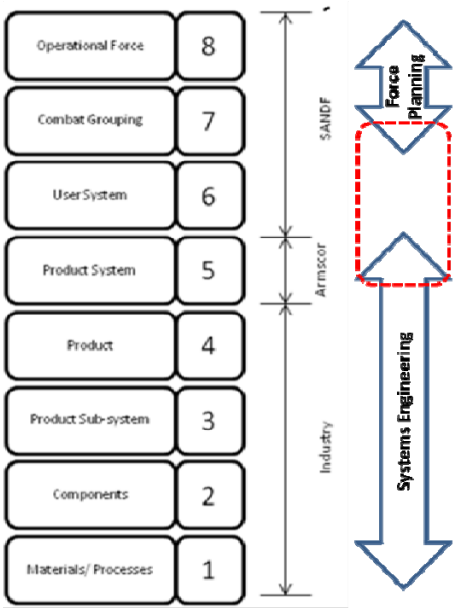


Figure 5: Area Investigated Indicated by a dotted line

RESEARCH STRATEGY

The majority of the research was based on work done and published by organisations implementing CBP. It is also important to note that, CBP is a new planning approach to many organisations. The Technical Cooperation Program (TTCP), established by the US, UK, Australia and New Zealand is by far the most advanced international organisation that has done work on CBP. The SE based on the SANDF acquisition will be investigated, and discussed only in a general sense, due to the security classifications within the acquisition process. The research strategy to be used will be a combination of the Evaluation research and the comparative study.

Evaluation research is related to traditional social research. It utilizes many of the same methodologies and it requires group skills, management ability, political dexterity, sensitivity to multiple stakeholders and other skills that social research in general does not rely on as much. (http://www.socialresearchmethods.net/kb/intreval.php).

The goal is to provide feedback to SANDF, Armscor and institutes providing decision support through research and analysis. This feedback will aid decision making in terms of implementation of CBP and the possible definition of a CE type of process to systematically link CBP and the Acquisition process.

RESULTS

The data was collected using a research questionnaire and interviews. The rationale behind the questionnaire was to gather the data in a guided manner and the interview was used as a follow up to allow more expression and detail.

CBP Implemented in the SANDF.

Figure 6 above provides the results of the responses of individuals to questions relating to implementation of CBP for planning in the SANDF. The information gathered deals with the way planning are conducted in the SANDF. The objective is mainly to establish if there are reasonable

elements of CBP in this planning. The reasonableness of these elements is mainly derived and compared to the literature. Figure 6 that majority believe that CBP is implemented in the SANDF. The closeness of the opposing views was mainly due to the understanding that there are processes in place to indicate efforts for CBP implementation; however the pace of has been slow.

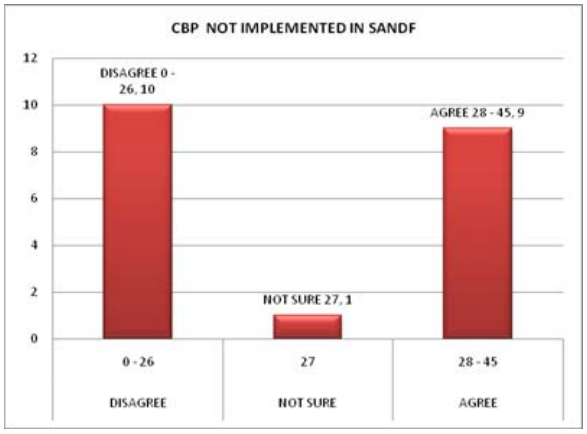


Figure 6: CBP Implementation

In the interviews conducted, the majority agree that the CBP language has been used in the SANDF, although implementation has been slow. The efforts that DDSI and CSIR in conjunction with DCD have taken to implementing CBP in the SANDF were highlighted. It was further established during interviews that there has been many documents and processes developed in an effort to implement CBP, but implementation has been slow.

The data gathered shows that the majority disagrees with the statements that supported that CBP is not being implemented in the SANDF. The supporting evidence indicated that elements related to implementation CBP were sufficiently supported to be available. Therefore Hypothesis 1 is rejected. There is sufficient degree of positive attitude to indicate that CBP is implemented in the SANDF.

Acquisition not linked to capability development.

The data gathered considered if the outflow of outputs from capability development forms an input to level 5 acquisition programmes. The questionnaire considered how the ROC is generated, whether J Ops is intimately involved in the generation of the ROC, and whether the need for the capability is validated before approved at the highest forums. The results of the nominal scale part of the questionnaire are presented by Figure 7. From the figure above it can be seen that there is a majority feeling that acquisition is indeed not linked to Capability development.

In the interviews it was clearly established that participants raised concerns about the extended time scales for the acquisition programs. The length of time it takes between the reviews of the SANDF was seen to always create problems in terms of matching the capability requirements to ROC. Some of the ROCs for the projects on the SCAMP are not dealing with the current requirements rather with the post democracy operational deficiencies.

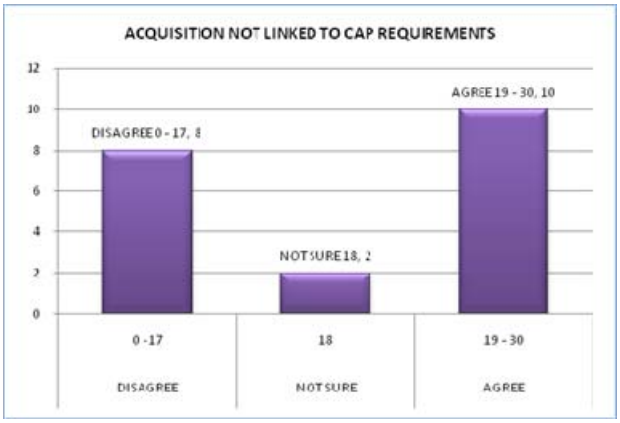


Figure 7: Acquisition link to capability development

The data gathered shows that the majority agrees with the statements that supported the fact that acquisition is not linked to capability development. Therefore Hypothesis 2 was not rejected.

Technology development is linked to capability development.

Figure 8 below displays graphically the data as gathered for Hypotheses 3. The objective was to measure the attitudes for technology development in the SANDF and its relation to capability planning.

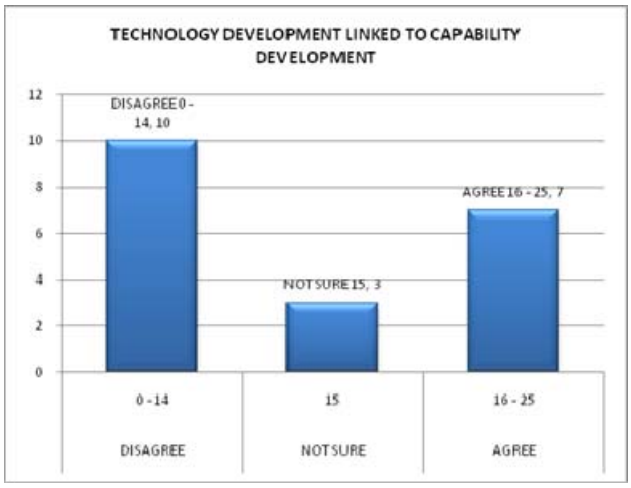


Figure 8: Technology development link to capability development

During the interviews it was emphasized that policies and procedures makes provision for synergy between technology development and capability development. It was also highlighted that the increase in defence industry coordination with the client to share ideas on technologies and requirements may see more and more technology development integration into overall defence capability planning. Limited funding for new technology projects was highlighted as a stumbling block in ensuring that capability development and technology development are aligned. The data gathered indicates that the majority disagrees with the statements that supported the fact that technology development is linked to capability development. Therefore Hypothesis 3 was rejected.

Capability Engineering not adaptable for SANDF.

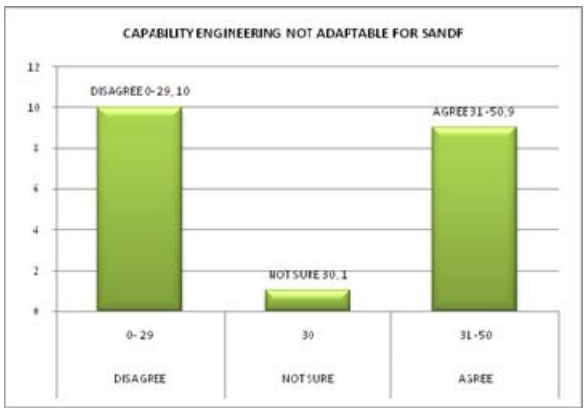
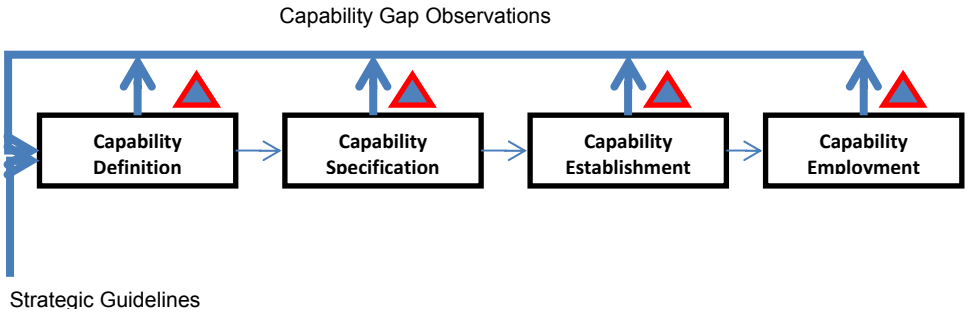


Figure 9: Capability Engineering Concept

Figure 9 above displays graphically the data that measured the attitudes towards the concept of capability engineering as introduced in chapter 3.

During the interviews it was mentioned that the concept of CE will be adaptable to the SANDF however the challenge will be in the implementation due to lack of skills. Some argued that the biggest challenge in the SANDF is that there are various good and elaborate processes in the SANDF that fail due to lack of systems thinking skills. The emerging Capability Life Cycle (See

Figure *10*) in the SA context (Oosthuizen R, 2008) was highlighted during interviews as a basis for capability engineering. It was further mentioned that CLC exceeds lifetimes of single systems.



F*igure 10: Capability Life Cycle(Source: Credible Defence Capability, Command and Control at the core*)

The data gathered indicates that the majority disagrees with the statements that supported the fact that CE is not adaptable to the SANDF. Therefore Hypothesis 4 is rejected.

CONCLUSIONS AND RECOMMENDATIONS

The investigation has shown that there is indeed a gap that exists between capability development and system engineering as suggested in preceding paragraphs. The investigation was conducted focusing on the implementation of CBP as a planning tool for capability development, the link between capability requirements and acquisition, the link between technology development and capability development and capability engineering as a possible concept to adopt for high level engineering.

The data gathered for hypotheses 1 show that the majority disagrees with the statements that supported CBP not being implemented in the SANDF. Whereas many of the people interviewed acknowledged challenges in the implementation of CBP, it is acknowledged that the processes allow for a shift to CBP. The objective of the questions posed for the hypotheses was mainly to establish whether the processes and procedures currently in place allow for CBP. It however could be established especially in the interviews that there seems to be challenges in implementation. There was generally a positive attitude towards the implementation of CBP, hence hypotheses 1 was rejected. A more robust policy of procedure must be implemented to aid the implementation of CBP as a planning tool for planning. Top level management (SANDF) must be the drivers of CBP implementation.

The data gathered for hypotheses 2 shows that the majority agrees with the statements that supported the fact that acquisition is not linked to capability development. With the ROC generated by the Services, there is a caution always faced in ensuring that the gap as identified is from a joint perspective. Capability requirements are specified by C J Ops for level 7 planning. The involvement of J Ops division at the approval may be late in ensuring that the gap as analysed and documented in the ROC addresses joint requirements and should be a result of Capability gap analysis. As the gathered data has also indicated the majority's rejection of the fact that acquisition is linked to capability requirements. Therefore Hypothesis 2 is not rejected. From this it can be established that the ROC must be derived from the Capability requirements. J Ops must not only be involved in the approval process, but must provide a basis for all ROCs.

The data gathered for hypotheses 3 indicates that the majority disagrees with the statements that supported the fact that technology development is linked to capability development. The participants generally showed a negative attitude when responding to whether technology projects are linked to acquisition projects. The establishment of process and procedures in dealing with technology management as part of the defence capability development is required to stabilise the interface and make it more effective. There must be alignment through process for technology development and capability planning. A process is required to align technology development and capability planning.

The data gathered for hypotheses 4 indicates that the majority disagrees with the statements that supported the fact that CE is not adaptable to the SANDF. Therefore Hypothesis 4 is rejected. The gap between high level planning and lower level systems engineering requires a deliberate effort to bridge. This concept has proved to be useful in the implementation of CBP and bridging the gap to acquisition. This study has managed to establish that the concept will be adaptable for SANDF and there have been efforts in advancing this. Whereas DAP 1000 may be a useful guideline in the acquisition phase, it is important to develop a policy and/or procedure to manage engineering at high levels.

The closeness of the results to hypotheses 1 to 4 attained from the survey questionnaire, shows a trend in the difference in attitude between uniformed members and non-uniform members. This trend indicates that while uniformed members are content with the related processes and policies, and believe that there is no significant gap between capability planning and acquisition of product systems, whereas many in the industry and research institutes believes the gap is significant. This creates a problem in the interaction between the Client (SANDF) and stakeholders that must provide decision support. This in turn makes decision making very difficult for the decision makers. The

process to close the identified gap needs to be iterative and cannot be viewed as a one dimensional process. Hence the interaction of all stakeholders remains very critical to its success.

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