STRENGTHENING HUMAN CAPABILITY THROUGH DEFENCE OFFSET AND INDUSTRIAL COLLABORATION RESOURCES

Kogila Balakrishnan[1*], Khalifah Badia[2] & Ananthan Subramaniam[3]

[1]WMG, University of Warwick, UK
[2]General Authority for Military Industries (GAMI), Kingdom of Saudi Arabia
[3]National Defence University of Malaysia (NDUM), Malaysia

[*]Email: Kogila.Balakrishnan@warwick.ac.uk

ABSTRACT

This paper proposes a policy framework for using offset and industrial collaboration (IC) to develop human capability in the defence and security sector, focusing on Malaysia. It underscores the importance of integrating human capital development with traditional defence spending. Key challenges and success factors in executing offset policies for human capability enhancement are identified. The introduced 'MINERVA' framework includes elements such as a clear vision for human capital development, capability gap analysis, knowledge transfer incentives, credible partners, governance frameworks, stakeholder engagement, efficient project implementation, and assessing absorptive capacity. Through qualitative analysis of Malaysian case studies, the paper highlights optimising defence budgets for skills, education and training. The paper argues that the alignment of international defence procurement with offset policies focused on human capital development can enhance indigenous defence capabilities, military potential, job creation, regional clusters and exports. This alignment bolsters national security and resilience against challenges such as digitalisation and pandemics.

Keywords: *Offset; industrial collaboration; defence and security; human capital development; MINERVA framework.*

1. INTRODUCTION

Offset or industrial collaboration (IC) is a policy tool used by importing nations to encourage investment, technology transfer and human capital development in domestic industries through international defence procurement contracts (Balakrishnan & Matthews, 2009, Matthews & Anicetti, 2022). Unlike mainstream economic policies such as investment incentives and trade policies (Zeiler, 1998), offset are primarily used to enhance national security by reducing dependence on external sources and building indigenous defence capabilities (Balakrishnan, 2018, Balakrishnan, 2022). The state has a strong interest in entering into an offset agreement with foreign contractors to build indigenous defence industrial capability, as well as enhance military potential, jobs, regional clusters and exports (Balakrishnan, 2018, Maharani *et al*., 2023). Despite its benefits, the secretive nature of the defence sector makes it challenging to publicly justify the relevance of offsets as a constructive policy tool (Malm *et al*., 2016; Balakrishnan, 2018, Anicetti, 2024).

Empirical studies have shown that offset contribute to economic and industrial growth, particularly in building defence industrial bases (Martin, 1996; Brauer & Dunne, 2004). These studies often focus on macroeconomic impacts and organisational improvements in quality, processes, systems and technology (Balakrishnan & Matthews, 2009; Situmeang *et al*., 2020; Matthews & Maharani, 2021). However, there is a lack of research on how offset enhance human capability through skill and knowledge development, largely due to the confidentiality of defence data.

This paper addresses this gap by exploring how defence offset can develop human capability. Despite 30% of global defence budgets being allocated to offset (SIPRI, 2022), research on their impact on human capability development is limited. The proposed MINERVA policy framework aims to provide adaptable guidelines for governments, defence ministries and multinational corporations involved in offset and IC.

Human capital development is increasingly critical for economic growth, social mobility and global competitiveness. The UN's Fourth Sustainable Development Goal and UNESCO's Education for Sustainable Development framework highlight the importance of lifelong learning and skill development (UN, 2023; UNESCO, 2023, OECD, n.d.). National offset policies often include elements such as technology transfer and job creation, which are crucial for building capability (Nam & Joon, 2004; Maniar, 2018). However, unclear funding stipulations can hinder these objectives.

The defence sector's evolving demands, driven by geopolitical tensions and rapid technological advancements, necessitate significant investment in training personnel in emerging technologies (UK Parliament, 2023). Traditional defence spending prioritises equipment and infrastructure over training and education. The rapid advancement of emerging technologies in artificial intelligence (AI), cyber, robotics and advanced manufacturing, primarily originating from the commercial sector, must be adapted for defence applications. This adaptation requires significant funding to train personnel in these areas. The capabilities needed by companies and the methods for building these skills have evolved. Rapid technological progress and the introduction of disruptive technologies have created an urgent demand for new human capabilities within the defence sector. Unlike more agile sectors, the defence industry struggles to rapidly acquire new capabilities to meet evolving demands. RAND Europe, commissioned by the European Defence Commission, has undertaken major projects to study how to build skills for the defence sector (Galai *et al.*, 2023). Additionally, the demand for skill development has been intensified by the war resulting from Russia's invasion of Ukraine (Antinozzi, 2023). The Lowy Institute's Asia Power Index mentioned that countries such as the US, South Korea and Singapore invest significantly in training to maintain military capabilities (Lowly Institute, 2023).

This research aims to develop an enhanced offset policy framework to nurture human capability in the defence sector. It identifies critical success factors for leveraging offset funding and explores challenges in building human capability. Using Malaysia as a case study, the research defines "capability" as skills, expertise and technological prowess.

The paper is structured into five sections: the Introduction establishes the study's context; the Literature Review provides an overview of offset and their role in defence industry development; the Research Methodology details the study's approach; the Data Analysis and Findings section discusses the results; while the Conclusion offers a policy framework and acknowledges study limitations.

2. OFFSETS AND HUMAN CAPABILITY

2.1 Theory of Offset

The primary aim of a procurement strategy utilising offset is to ensure nations build indigenous defence and security industry capabilities, reducing dependence on foreign sources, as well as promoting self-sufficiency (Brauer & Dunne, 2004). Offsets enable importing nations to gain economic, industrial and technological benefits beyond the procurement itself. Although precise global data is lacking, offsets are estimated to constitute around 30% of global military spending, approximately $672 billion in 2022 (SIPRI, 2022). Offset are known by various terms such as industrial participation, collaboration and engagement (Brauer & Dunne, 2004). Some countries have adopted more competitive policies to sustain their defence industries. For instance, Canada refers to offsets as "industrial and technological benefits" (Government of Canada, 2022), Australia as the "Australian Industrial Capability Programme"

(Australian Government, 2016), and the UK as "Capability, Skills and Prosperity" requirements. The US employs offsets through the "Buy America Act," "Defence Production Act," and "Small Business Act" (Zeiler, 1998).

While often considered a modern practice, offset trace their roots to ancient times when technology transfer occurred through trade, conquest and diplomacy (Trigger, 2003). A notable 19th century example is Japan's Meiji era, during which Western technologies were adopted through engagement with foreign experts (Huffman, 2010). Modern offsets emerged in the 21st century, evolving from post-World War II efforts aimed at rebuilding Europe's defence industry and integrating American equipment for interoperability. By the 1990s, offsets were formalised in procurement policies and tenders (Balakrishnan, 2018). Globalisation has since increased the complexity of offset, balancing multinational supply chains and government mandates to protect national security and retain industrial benefits locally (Brauer & Dunne, 2010; Balakrishnan, 2018). Examples include Saudi Arabia's Industrial Participation Policy, UAE's Economic Vision 2030 (Government of Abu Dhabi, 2023), and Malaysia's Industrial Collaboration Policy (ICP) (TDA, 2022), focusing on innovation, technology transfer, skills development and strategic alliances.

Offsets are driven by commercial and geopolitical interests. Defence contractors view offset as opportunities for international growth and compliance, transforming what was once seen as a burden (Dehoff *et al.*, 2014). Geopolitically, technology transfer fosters platform commonality and interoperability among allied nations, exemplified by the AUKUS alliance and Saudi Arabia's drone purchase from Turkey, which emphasises long-term industrial partnerships (Savoy & Staguhn, 2022; Dutton, 2023). National aspirations to establish a sustainable defence industrial base motivate the attraction to offset. These aspirations include military capability support, economic development, innovation and human capital development, crucial for a skilled workforce capable of sustaining a resilient defence industry (Hartley & Martin, 1995; Balakrishnan & Matthews, 2009).

Critics argue that offset inflate procurement costs and complicate delivery due to supply chain disruptions, intellectual property risks and regulatory compliance issues (Goodman, 2024). Despite many countries emphasising human capability in offset policies, resource allocation remains debated. The next section explores offsets' contribution to capability building.

2.2 Offset and Capability-Building

"Capability" refers to the power or ability to achieve specific tasks or goals at individual, organisational, and systemic levels (Vincent, 2008). This paper aligns with endogenous growth theory, emphasising the link between technology, human capital, innovation and knowledge for enhanced productivity and economic growth (Romer, 1986; Lucas, 1988). As technology evolves, so do skill requirements, necessitating investments in education, research and innovation-friendly regulations. Capabilities, which combine knowledge, skills, expertise and technology, should yield competitive advantages and contribute to organisational survival and prosperity (Winter, 2000; Oppat, 2008; Ogunade, 2011).

In the defence sector, capability development focuses on military capability, with offset historically used to enhance defence industrial capacity. This includes research, manufacturing, supply chains, infrastructure, technology bases, partnerships, exports, innovation, quality control and testing. This paper emphasises the importance of linking technology to human capital, fostering a more productive workforce and sustained economic growth. As nations advance technologically, the demand for high skills increases, highlighting the need for robust education, R&D support and a regulatory environment that promotes innovation (Lucas, 1988).

Organisational capability, influenced by dynamic capability (Teece, 1997) and absorptive capacity (Cohen & Levinthal, 1990; Argote *et al.*, 2003; Argote & Miron-Spektor, 2011), involves an organisation's ability to adapt and reconfigure competencies in a changing environment. Offsets in the defence sector are crucial for developing these capabilities, ultimately contributing to national

prosperity. Many countries, including India, Saudi Arabia, the UAE, Turkey, South Korea, Brazil and South Africa, use offsets to build their defence industrial and technological capabilities. These policies mandate that a portion of procurement contracts supports diversification, technology transfer, local manufacturing, job creation and skills development to enhance indigenous defence capabilities (Hartley & Martin, 1995; Brauer & Dunne, 2004; Bitzinger & Kurç, 2019). Empirical studies, particularly case studies, have evaluated these activities' success in developing organisational-level defence capabilities, focusing on technological advancements, system innovations, economic impacts, job creation and higher local salaries. However, the term "capability" is rarely explicitly mentioned in offset policies, except in Australia and the UK, where it is linked to building defence industrial capability through procurement (Australian Government, 2001, 2016, 2020; UK Defence Capability Framework, 2022).

2.3 Human Capital Development for Delivering Human Capability

Nevertheless, people and their skills are crucial for building defence capabilities. This paper emphasises the necessity of allocating adequate resources for human capital development to create a sustainable and resilient defence industrial base. It distinguishes between human capital and human capability. Human capital includes tangible qualities such as knowledge, skills and expertise gained through education, training, work experience and personal development. This encompasses technical skills, problem-solving abilities, and interpersonal skills. On the other hand, human capability extends beyond these tangible qualities, encompassing the broader potential and capacity for individuals and groups to perform tasks, solve problems and adapt to change. In the current context, human capability involves investing offsets resources into human capital development to enhance skills, knowledge and productivity (Malm *et al*., 2016). Building human capability through offsets involves the transfer of know-how from foreign institutions to individual knowledge recipients. Success hinges on the credibility and competency of the foreign institution and the technology recipient's ability to absorb and apply the knowledge (Balakrishnan & Lazar, 2022).

However, there is a lack of explicit mention of human capital development in most offset policies. Some aspects of policies may indirectly contribute to skills enhancement and workforce development. Some countries do recognise the importance of developing human capability and have introduced policies to support this vision. Countries such as the UAE, Oman, Türkiye and South Korea have encouraged human capital development using offsets resources.

Malaysia started with a structured offset policy primarily for the defence sector in 2005. The policy was further enhanced to become the National Offsets Policy in 2010(Balakrishnan, K, 2007). The policy subsequently evolved to become the Industrial Collaboration Policy in 2015 and had been reviewed several times under the leadership of the Ministry of Finance (MOF) (TDA, 2022). All the mentioned policies had explicitly focused on human capability through various HCD programmes for the defence, dual-use and commercial sectors. In the past, OEMs have been incentivised with huge offset credits to support with developing local talents and skills for the various industrial sectors. MOF together with the Defence Industry Division (DID) at the Ministry of Defence continue to focus on utilisation of offset and ICP for human capital development. Malaysia however does not have specific policy framework dedicated to human capital development although there are mentions of the importance of HCD in the Twelfth Malaysia Plan (2012 – 2025) (Ministry of Economy, 2021) and specific tools such as the national training index have been created by the Human Resource Development Fund (HRDF) (HRM Asia, 2024).

However, the Kingdom of Saudi Arabia is an interesting example of a country that is driving forward the human capital development agenda through offset and defence procurement but more widely through its Vision 2030 Policy (Bilal, 2013; Kingdom of Saudi Arabia, 2023; Gulf Research Center, 2023). The General Authority for Military Industry (GAMI) created the National Military Industry Human Capital Development (NMIHCD), a dedicated department that is currently implementing key human capital development (HCD) strategies and initiatives (Military Industry Human Capital Strategy). The HCD initiatives provide mature services for the military industry sector that are in place

to deliver growth and increase the awareness of offset spend through its Industrial Partnership Program (IPP). GAMI's human capital development policy aims to clarify the roles and responsibilities for all stakeholders and articulates how stakeholders interact to deliver qualitative and quantitative growth of Human Capital in the sector, (GAMI Policy and Regulation). The IPP authority within GAMI together with other strategic partners and end-users have taken the initiative to infuse NMIHCD with GAMI in providing clear, mature and tailored opportunities to 'spend' IPP credits based on a win-win-win situation for the Kingdom (Asharq, 2022). For the Kingdom, examples of these services include the Military Industries Scholarship Program, the Military Industries Short Courses Program, and the Academy for Defence Industries (ADI). ADI, the first of its kind in the Kingdom and the region is the dedicated training provider that serves as the leading institute that delivers vocational training, short courses and technical training partnered with original equipment manufacturers (OEMs) locally and overseas (ADI, 2023).

2.4 The MINERVA Framework

The MINERVA framework, introduced by the authors in Figure 1, outlines essential components for planning and implementing HCD programmes using offset resources. It identifies critical success factors such as localising HCD programmes, stakeholder engagement, knowledge exchange, effective project management, incentives from offset authorities, and mature relationships among partners. The challenges include difficulties in localising complex technical transfers, managing risks, ensuring governance, and clear roles. The framework is designed to be generalisable for governments and offset management offices, particularly in the defence sector but more generally for national critical infrastructure projects (CNIs). This paper uses the MINERVA model to explore Malaysia's use of offsets to enhance human capability in the defence industry through an international educational partnership between institutions in the UK and Malaysia, investigating the successes and challenges in planning and implementation stages. The framework is designed to be generalisable and can assist governments considering the use of offset or other Government-to-Government (G-to-G) funding for HCD projects. It is applicable to offset management offices (OMOs), and Ministries of Defence and Finance by helping to guide their HCD project planning. Additionally, academics can use this framework to critically examine the factors influencing HCD programmes and identify gaps for further research in this field, particularly in the defence and security sectors.

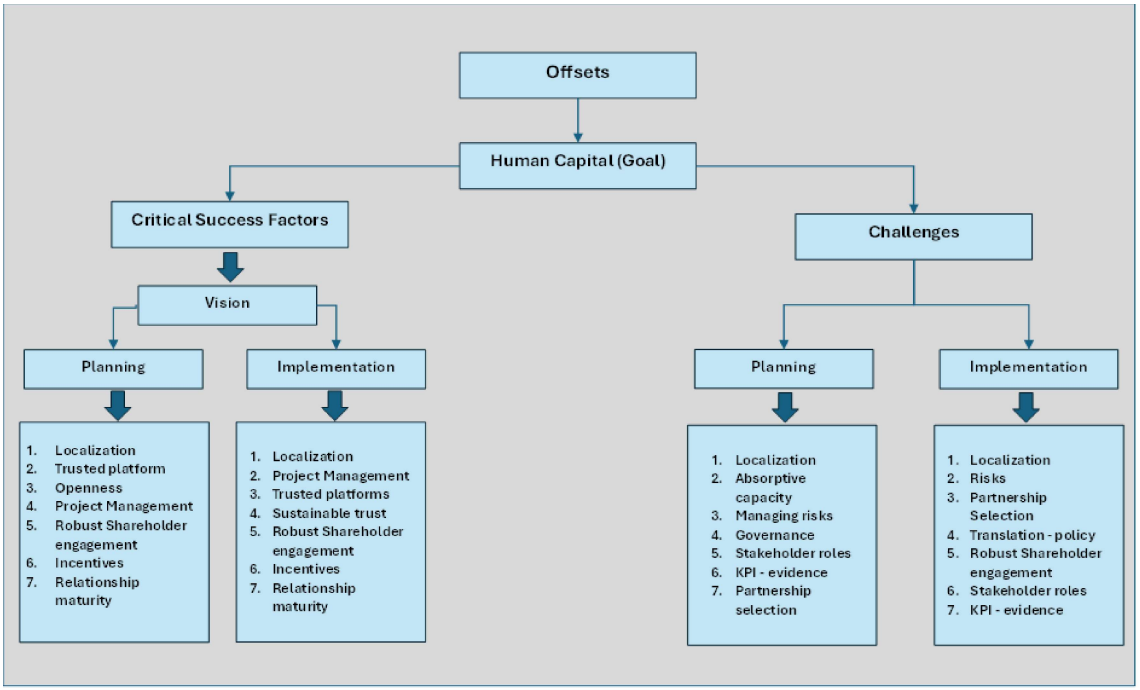

Figure 1: The Minerva framework.

Malaysia has explicitly integrated HCD into its ICP, leveraging offset resources to enhance capabilities in the military, defence, security and dual-use sectors. This approach is evident in major procurement contracts, which include HCD projects. Using the MINERVA framework, this paper examines how Malaysia, with a defence budget of 1.5% of its gross domestic product (GDP), has utilised offsets to improve its defence industry's human capability. The research focuses on an international educational partnership formed through an offset agreement between academic institutions in the UK and Malaysia, analysing the successes and challenges during the planning and implementation stages of these educational programmes.

3. RESEARCH METHODOLOGY

This exploratory research delves into the practical challenges of using offsets funding for HCD to enhance human capability within the defence industry. The study addresses the research question of how offset funding can effectively build human capacity were measuring the impact of HCD within offset policy framework is difficult due to a lack of specific indicators. Focusing on a Malaysian HCD programme funded through offset, this paper uses the MINERVA model to assess success factors and challenges. The research aims to develop a policy framework for effectively delivering HCD initiatives and building human capability using offset resources (Yin, 2018; Abdullah, 2019). Insights are drawn from the author's direct involvement in shaping offset policies and HCD, as well as their experiences in planning and implementing HCD projects. Theoretical perspectives are based on observations, participation in meetings, and reflections (Glaser & Strauss, 1967). The study employs both deductive and inductive methods (Saunders *et al.*, 2019) through a mixed-method approach, emphasising actionable outcomes for stakeholders. By combining qualitative and quantitative data, the research identifies patterns, theories and relationships, confirming deductive practices from the literature (Creswell & Poth, 2018). The aim is to bridge theory and practice by reviewing the literature on offset, defence industry capability and HCD, alongside practical experiences from policymaking, implementation and stakeholder engagement (Saunders *et al.*, 2019).

Data collection includes primary sources such as company and university project reports, and semi-structured interview questionnaires, as well as secondary sources such as scholarly articles, books, policy documents and government reports (Creswell & Poth, 2018; Abdullah, 2019). The semi-structured questionnaire comprises predetermined questions about the respondents' prioritised factors, identified through both deductive and inductive approaches, and includes open-ended questions for additional insights.

The units of analysis relate to the specific HCD programme for this research. This specific programme has been chosen as the case study considering the authors were directly involved in formalising the educational partnerships besides the planning and implementation of the projects throughout the 12-years period. Furthermore, this advantage enabled the authors to get access to the data and access to participants who were directly involved in the project. The programme consists of an academic partnership between University A in Malaysia and University B in the United Kingdom. The research was focused on three projects worth approximately GBP 4.5 million delivered through this partnership between 2012 and 2024. The respondents were from these three stakeholder groups being the government, industry players and academia. A total of 25 interviewees were identified from a pool of potential stakeholders who were directly involved in the three identified projects being Projects 1, 2 and 3. The participants were individuals operating at strategic and decision-making levels, senior management who had substantive knowledge and experience in offsets policy, as well as academics who were directly involved in the knowledge transfer programme (Lavrakas, 2008). The questionnaire was sent out via email to all the respondents with clear instructions and notes explaining the research background and what was expected of them, along with a request for interview slots with prospective participants. Out of the 25 participants, 18 (75%) responded. Table 2 describes the participants and their roles.

The researchers obtained prior written approval from the participants to record and transcribe interviews for accuracy. An email with a consent note outlining ethical processes and researchers' responsibility to safeguard identities was sent, anonymising respondents' identities to comply with the General Data Protection Regulation (GDPR) and data protection. Participants were assured of confidentiality and transcripts would be destroyed post-publication.

The 18 respondents were successfully interviewed, acknowledging limitations in participant number, especially from government and OEM sectors. Despite potential biases, rich input from participants compensated for the limited responses. The researchers, as practitioners, used a pragmatic inductive participatory observation approach to ensure data reliability.

Table 1: Roles of interview participants.

Stakeholder Segment	Description of Required Role	Code
Academic	Academic Project Lead for UK University	R1
OEM	Offsets Manager	R2
Government	Principal Assistant Secretary, Offsets Authority, Ministry of Defence	R3
Academic	Academic Project lead from Malaysian University	R4
OEM	Offsets manager, local office Malaysia	R5
Academic	Academic Project lead from Malaysian University	R6
Academic	Tutor	R7
Academic	Academic Project Lead for UK University	R8
Senior management	Senior Programme Director for Malaysian University	R9
Project lead	OEM	R10
Academic	Senior Programme Director for Malaysian University	R11
Senior Management	Deputy Vice-Chancellor Malaysian University	R12
Business Development	OEM	R13
Academic	Tutor UK	R14
Academic	Tutor Malaysia	R15
Academic	Tutor Malaysia	R16
Academic	Tutor UK	R17
Academic	Academic Project lead from Malaysian University	R18

Thematic analysis was conducted for methodically examined literature and documents, with thematic coding of keywords such as HCD, challenges and policy suggestions. Content analysis of interview findings identified themes to standardise data for relationship identification (Seidman, 1998; Braun & Clarke, 2006). Excel spreadsheets tabulated ranked factors, providing quantitative measures for success factors and challenges hierarchy.

4. Results and Discussion

This section outlines the results from the data collection and discusses the outcome based on the research questions. The section is divided into six sub-sections. Section 4.1 illustrates the relevance of HCD to the Malaysian offset policy while Section 4.2 sets the background to the three individual projects and outcomes. Section 4.3 critically analyses the success factors for enabling the educational

projects, while Section 4.4 discusses the challenges faced in planning and delivering the projects using offset resources. Section 4.5 then discusses the relevance of offset for HCD, while Section 4.6 provides recommendations from respondents on how to enhance the policy by incorporating HCD for building human capability for the defence industry sector.

4.1 The Malaysian Offsets Policy and the HRD Offsets Programme Background

Malaysia's ICP 2015 emphasises on human capital development within the offset framework, allowing recipients to enhance skills relevant to procurement. The policy includes provisions for industrial training and skills expansion (PMO, 2019). Universities such as the Malaysian National Defence University (NUDM), University Kuala Lumpur (UniKl), Universiti Teknologi Malaysia (UTM) and Universiti Malaysia Terengganu (UMT) have benefited from offset by offering various educational programmes. A government-to-government agreement established a partnership between Malaysian and UK universities, focusing on defence industry excellence and localising programme delivery.

Table 2 lists the academic projects funded through the offset programmes, with further details provided in the next section.

Table 2: Summary of project outcome and funding.

Project	Partnership	OEM	Number of students (total)	Number of students who graduated	Total graduated for each programme	Shadow tutors trained	Total Funding (GBP)
MSC in Engineering Business Management (Defence and Security)	Malaysian University (A) and UK University (B) and UK University (C)	OEM (France)	2012 - 20 2013 – 24 2014 – 23 2015 - 19	2012 -18 2013 – 21 2014 – 21 2015 - 18	78	7	1.1 million
MSC in Cyber Security and Management	Malaysian University (A) and UK University (B)	OEM (Sweden)	2016 – 18 (2 terminated) 2018 – 6 2019 – 18	2016 – 15 2018 – 5 2019 - 15	35	4	1.2 million
MSC in International Technology Management for Defence and Security	Malaysian University (A) and UK University (B)	OEM (UK)	2019 -13 2022 – 9 2023 - 20	2019 – 11 2022 – 0 2023 - 0	11 to date	10	1.2 million

Source: University A

4.2 Project Background and Outcome

4.2.1 Project 1: MSc in Engineering Business Management (Defence and Security)

Project 1, a MSc programme in Engineering Business Management (EBM) for Defence and Security, was funded by the offsets from the Scorpene submarine procurement from DCNS France (2000-2008). This four-year, GBP 1.1 million project aimed to integrate business management into engineering and technology for the Malaysian Armed Forces (MAF), Ministry of Defence and defence industry

professionals. It included a localisation component for training University A academics in Malaysia and the UK to eventually deliver the programme locally. Led by University B with support from Universities A and C, the content and curriculum were developed through need analysis workshops.

From 2012 to 2015 (Table 4), 85 students were enrolled, and 78 graduated with an MSc in Engineering Business Management for defence and security. Seven University A academics were trained in module delivery, while 15 tutors were trained in MSc project supervision. A workshop in March 2013 familiarised supervisors with Universities B and C's dissertation supervision processes procedures and norms for dissertation supervision.

2.2 Project 2: MSc in Cyber Security and Management (Defence and Security)

Project 2 involved a three-year MSc programme in Cyber Security and Management funded by GBP 1.2 million from the offsetf programme associated with the 155 mm gun procurement for the littoral combat ship for the Royal Malaysian Navy (RMN) (SIPRI, 2023). This initiative, part of the 10th Malaysia Plan, aimed to enhance information and communications technology (ICT) capabilities for economic transformation while addressing cyber risks (Economic Planning Unit, Prime Minister's Office, Malaysia, 2010). The Defence White Paper 2020 highlighted cybercrime as a major threat, necessitating the development of a robust industrial base to support the cyberforce (MOD, 2020). The programme, delivered by University B in partnership with University A, capitalised on strong UK-Malaysia cyber-intelligence cooperation (EITN Malaysia, 2016). The curriculum covered network security, computer security, information security, encryption, intrusion detection, penetration testing, access control, digital forensics, risk management, and security governance. Between 2016 and 2019, 36 students enrolled in the programme, and 35 graduated with an MSc in Cyber Security Management. However, only four of the 10 University A academics completed their training under the localisation programme during this period, due to disruptions from the COVID-19 pandemic and budget implications.

4.2.3 Project 3: MSc in International Technology Management for Defence and Security

Project 3 involved a MSc in International Technology Management (ITM) for Defence and Security, funded by GBP 1.2 million from the offsets programme for the short-range missile systems (SHORAD) procurement for the Malaysian Army. Launched in 2019, this programme addressed the Ministry of Defence's requirement to integrate emerging technology management into the defence sector, following the 2010 Defence Industrial Blueprint's focus on skills in hard technology and management (MOD, 2010). Universities A and B collaborated to deliver the ITM programme, offering modules in technology management, strategy, systems thinking, international defence acquisition, project management, finance, and leading change. As of 2024, 42 students enrolled, 13 have graduated and 20 are expected to graduate soon. A total of ten academics were trained for future module delivery, with University A receiving intellectual property rights for the course material. However, the project faced delays due to COVID-19, extending from 2019 to 2024.

4.3 Critical Success Factors (CSF) That Had Enabled the Success of HCD Programmes at the Planning and Implementation Stages

4.3.1 Planning and Implementation

The quantitative survey results were analysed using ranking to determine the critical success factors (CSFs) (Figure 2). The results reveal that localisation (1) was the most crucial consideration during the planning stage. This was followed by establishing a trusted platform (2), openness in knowledge exchange (3), effective project management (4), robust stakeholder engagement (5), relationship maturity (6), pragmatic policy (7), and sustainable trust (8).

Figure 3 identifies localisation (1) as the most critical factor during the implementation stage, followed by effective project management (2), sustainable trust (3), a trusted platform (4), openness in knowledge exchange (5), pragmatic policy (6), stakeholder engagement (7), and relationship maturity (8).

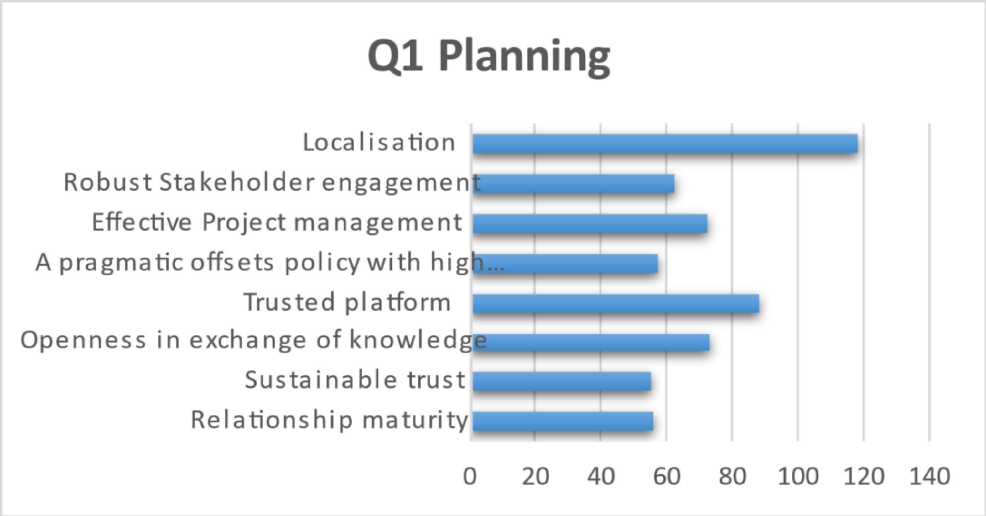

Figure 2: CSF for planning of HCD programmes using offset resources.

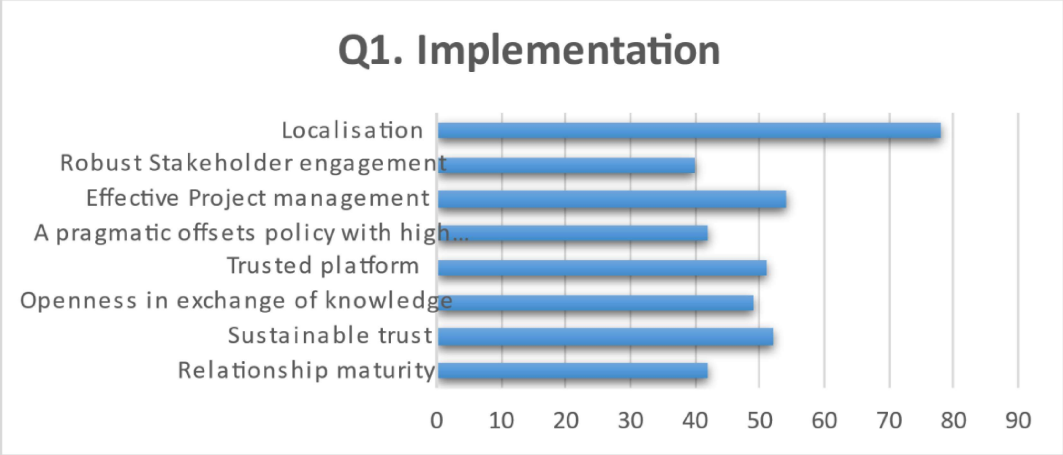

Figure 3: CSF for implementation of HCD programmes using offset resources.

4.3.2 Analysis of Factors Critical for Using Offset Resources for HCD Programmes

During the interviews, several other factors for success emerged as illustrated in Table 3. The synthesis approach through merging of quantitative and qualitative data identified several key themes and conclusions for prioritising critical factors at both the planning and delivery stages of offset projects. The analysis highlighted several essential points. Firstly, critical factors differed between the planning and implementation stages. During planning, localisation, trusted platforms for engagement and knowledge exchange were prioritised, followed by effective project management. In the implementation phase, localisation remained crucial, followed by effective project management, sustainable trust and trusted platforms. Sustainable trust was deemed least important at the planning stage, while relationship maturity was least important during implementation. Localisation emerged as the most critical factor for success in utilising offset resources for capability building (R1, R2, R9, R12,

R14 and R16). Trust also scored highly at both stages, reflecting the necessity of mutual trust among stakeholders for effective knowledge exchange. Project management was critical for systematic project planning, implementation and monitoring.

Table 3: Qualitative results from the interview.

CSF	Explanation	Respondents
Vision	Vision as a driving force for carrying through the programme difficulties.	R2, R5, R9 and R16
Team	Ensuring that the right people are on the team, in the right roles, with the right skills.	R2
Skill sets	Different skills required to plan from those delivering	R2
Project management	Consistency across the programme schedule	R2, R4 and R9
Partner selection	Importance of selecting competent, capable and ambitious partners	R2
Product and services	Availability of good product and services	R2
Localisation	• Local tutors using material to feed into their own modules • Secondment and shadow tutoring • Placement at partner institutions	R1, R2, R9, R12, R14 and R16
Relationship maturity	• Strong engagement with the student's post-graduation for continuous education • Good understanding between the partners and other stakeholders	R1,R5, R10, R11, R15 and R17
Inter-cultural understanding	• Knowledge and understanding in both of different culture and environment.	R11

Secondly, policy content and incentives were not seen as critical for success at either the planning (ranked 7th) or implementation (ranked 6th) stages. However, qualitative data suggested that pragmatic policies and higher multipliers could attract better HCD projects. Thirdly, quantitative data indicated that relationship maturity was less prioritised as compared to other factors at the planning (6th) and implementation (8th) stages. This contrasted with qualitative findings that emphasised robust partnerships as crucial for success (R1, R5, R10, R11, R15 and R17). Fourthly, qualitative analysis revealed additional themes critical for success, including setting clear project visions (R2, R5, R9 and R16), selecting skilled partners, fostering teamwork, ensuring product and process quality, as well as promoting intercultural communication. Overall, there was a strong emphasis on localising projects, with the Ministry of Defence keen on transferring know-how to local institutions. Building trust and long-term relationships with academic and foreign partners was also crucial. Despite a more distant relationship with the armed forces, continuous engagement was emphasised to secure their buy-in and programme input.

4.4 Challenges in the Planning and Implementation of the HCD Programme

4.4.1 Planning and Implementation

During the programme planning stage, several challenges were identified. As illustrated in Figure 4, localisation was the most challenging aspect (ranked 1st), followed by absorptive capacity (2nd), risk management (3$^{rd)}$, evidence of key performance indicators (KPIs) (4th), governance (5th), stakeholder roles (6th), partnership selection (7th), and translation of the policy (8th).

At the implementation stage, as illustrated in Figure 5, localisation remained the most challenging aspect (ranked 1st). This was followed by risk management (2nd), partnership selection (3rd), stakeholder engagement (4th), translation of policy (5th), absorptive capacity (6th), KPI outcomes (7th), and governance (8th).

Figure 4: Challenges faced at the planning stages of the offset programme.

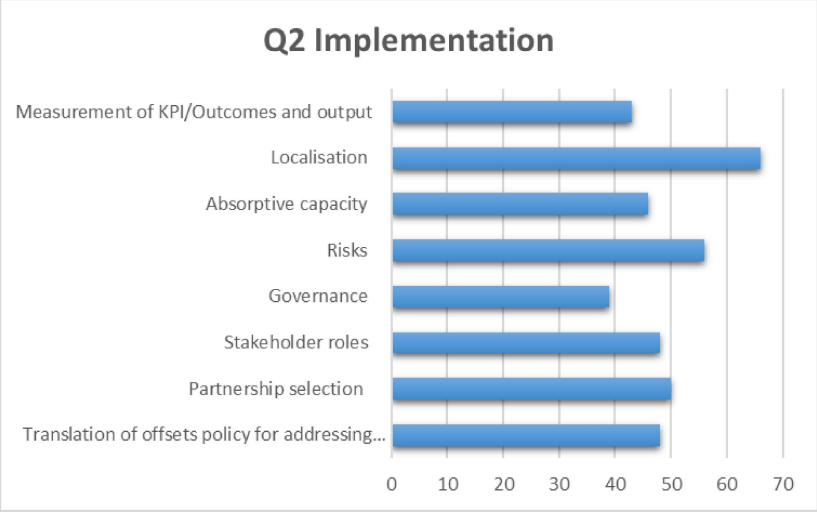

Figure 5: Challenges faced at the implementation stages of the offset programme.

4.4.2 Analysis of the Challenges in Delivering HCD Programmes

During the interviews, several other challenges emerged as illustrated in Table 4. The analysis of challenges in delivering critical priorities at the planning and delivery stages of offset projects highlighted several key themes and conclusions. First, challenges differed between the planning and implementation stages. At the planning stage, localisation, absorptive capacity and risk management were key. On the other hand, implementation focused on localisation, risk management and partnership selection.

Table 4: Other challenges in implementation.

Challenges	Explanation	Respondent
Curriculum and module changes	Changing focus of module content and curriculum needed to be aligned to the changing landscape	R7
Contracting and funding mechanism	• Clear identification of the partners commercial responsibilities and liabilities are essential along with transparent and performance-based funding mechanisms in place at the outset. • Lack of understanding to finances in delivery of the programme and constraints involved such as project implementation costs,	R2
Stakeholder alignment	Alignment of competing requirements of Government, Industry and Academic stakeholders needs to be carefully managed.	R3
Data sharing	Sharing all the necessary information to allow good decision making - schedule of student availability and all the costs associated with delivering a programme.	R2
Planning and implementation gap	People at the planning and implementation stage had different skills and lacked a seamless transition	R2
Offsets mechanism for approval and implementation of HCD at MOD	• The lack of an official and efficient mechanism for approving and implementing educational projects within offset agreements. • Bureaucratic hurdles, unclear processes, and inadequate coordination between relevant stakeholders, which made it challenging to align stakeholders' interests and ensure seamless collaboration throughout the project lifecycle.	R3
Size of the offset programme	Experience in using earned value management on a small project is costly not more than 100,000 not useful since the amount of data for perception is too small (the result will not be reliable).	R10

The scores indicate that localisation was the primary challenge. Concerns stemmed from OEMs' lack of commitment to content development, which is crucial for programme success due to their industrial expertise. In some cases, OEMs were minimally involved or reluctant, leading to disagreements between academic staff and company officials. Some tutors lacked sector-specific understanding, which impacted module quality, while others lacked industry experience, essential for real-world relevance, hindering trust between parties. Local institutions' commitment to localisation posed significant challenges, including deficiencies in plans, unclear KPIs, implementation gaps, difficulties in identifying tutors, and stakeholder buy-in issues. Local tutors lacked incentives and awareness of project objectives, viewing the assignment as an additional burden.

Partnership selection posed fewer challenges at the planning stage, but it became significantly more difficult during implementation. The ICP policy facilitated government-to-government partnerships, bypassing competitive bidding for university selection. University A was chosen for its specialisation in defence and security education, despite being relatively new, aiming to enhance its future programme offerings. University B, selected for its expertise in industry-oriented education, lacked strength in defence and security. Initially, the partnership thrived with strong engagement and leadership buy-in for five years, involving active participation from both institutions' academic and faculty members. In several projects, a notable lack of trust existed among stakeholders at the operational level. Both the

Ministry of Defence and overseas defence contractors, acting as offset sponsors, often remained passive and showed minimal interest in monitoring project progress. The contracts lacked clarity regarding the responsibilities of each delivery partner, resulting in convoluted decision-making processes and mutual blame for project setbacks.

A major governance issue within the programme and its partnerships was the inconsistency in contracts regarding the structure and roles of two-level committees. Sometimes, the OEM co-chaired committees, while at other times, either the overseas or local university partner chaired them. This inconsistency caused confusion and lack of clear responsibilities. Appointing an independent chair with relevant expertise could have ensured more consistent decision-making. Mid-project, the local partner's educational regulatory body revised its rules, demanding additional documentation from the overseas university regarding standards. Absorptive capacity posed a significant challenge during planning and remained low during implementation. The transfer of knowledge to students was hindered by issues with student selection and tutor choice. Deviations from student intake criteria impacted some students' ability to grasp module content and affected their performance. Furthermore, varying levels of English proficiency also influenced project quality.

The teaching and learning context were major issues, with many key project individuals lacking experience. The lead at University A, responsible for project planning, initially lacked sufficient expertise in defence and security content. This led to difficulties with student selection criteria, marketing and programme communication, as well as a lack of clear objectives and defined performance measurements such as key performance indicators. Insufficient emphasis on metrics and evaluation methods during programme design made it difficult to later capture project performance data. The ICP incorporated HCD but lacked clear implementation guidelines. Projects were chosen ad-hoc instead of using an evidence-based skills matrix. Guidance from the Ministry of Defence and local partners on skill gaps was lacking, with minimal industry engagement to develop a skills matrix. The programme's long-term vision was undefined, starting as a pilot and evolving without a clear direction. The strategic planning involved only a few senior officials, leaving others uninformed and fostering scepticism among stakeholders. Qualitative analysis revealed challenges, including the programme's failure to adapt content to technological advancements and issues with contract establishment, funding execution, as well as management between partners. Inadequate mechanisms for sharing data on materials, funding and processes were identified. In conclusion, delivering HCD projects through offsets faced challenges in localisation, risk management, absorptive capacity and governance. Addressing these issues requires clearer guidelines, better strategic planning and improved stakeholder engagement.

4.5 Views on Using Offset Resources for Building Human Capability

As indicated in Table 5, most respondents emphasised on the significance of using offset resources for industry-focused education and training projects that aim to solve real-world problems and enhance industry capabilities. Additionally, the respondents emphasised the need to maintain a balance between offering short-term skills courses through workshops and seminars, and providing long-term educational programmes that foster sustainable capabilities. The feedback also highlighted the greater value of intangible outcomes such as the transfer of know-how and knowledge through HCD projects, given their long-term impact on building sustainable human capabilities.

4.6 Suggestions on Enhancing Human Capability Through Offsets

The qualitative survey in Table 7 provides recommendations for enhancing human capability through offsets. Firstly, it stresses the need for defining success and establishing key performance indicators (KPIs). Secondly, it suggests implementing clear offset management processes guided by the Offset Management Office (OMO) at the planning and implementation stages. Evaluating foreign contractors' capabilities in delivering HCD projects and selecting partners with relevant skills and experience in defence are crucial. Intangible values such as sustainability, trust and relationships should also be included in KPIs. Recommendations extend to using offset funding for short courses covering technical areas and defence business topics, alongside transferable skills development.

Table 5: Summary of respondents' main viewpoints.

Viewpoints on offsets usage	Explanation	Respondent
Cross cultural exposure	Offset to be used for cross-cultural experiences and exposure to emerging technologies and industry of buyer countries	R1 and R4
Education versus training	Offset creating a balance on prioritisation between meeting short-term skills focus with long-term education and capability building focus	R6, R9 and R12
Industry focussed	Offset to focus on industry combined education programme for capability R&D and secondment. Investment into scholarship and TVET programme, workshops and STEM related projects	R3, R4, R2, R10 and R13
Risks plan and mitigation	Ensuring Offset planning considers a risk plan and mitigation	R2 and R3
Stakeholder engagement and leadership	Strong Leadership in managing stakeholders and buy-in	R3, R10 and R11
Sustainable knowledge management	Using academic and research institutions to deliver HCD projects rather than implementation through indexical companies which is short-term and lacks continuity	R5
Vision	Vision in what is to be achieved	R2 and R9
Incentives	Higher multiplier as incentives for transfer of soft knowledge – education and training/skills	R2, R4, R5 and R9
Capability gap	Identifying capability gaps and delivering in those areas	R6, R8 and R18

Table 6: Summary of respondents' suggestions for human capability using offsets funding.

Suggestions	Explanation	Respondent
Review KPI and Success	Offset policy need to define success and determination of KPI	R1
Offset management	Clear planning, process and implementation of how offset is used for HCD	R2, R10 and R17
Foreign contractor capability and track record	OEM with a good track record of HCD delivery and capability of execution Export focus on promoting HSC to support supply chain and life cycle management	R2 and R5
Short courses and training certification	Offset to be used to plan and deliver short courses	R4, R7 and R12
Centre of Excellence (COE)	Offset to be used as catalyst for the formation of COEs, research centres, MRO centres, Centre of Innovation and Data management centre	R4, R7, R9, R12 and R18
Values	Offset and procurement decision making to consider sustainability, trust, and relationship for 'out of the box' thinking.	R9 and R13
Transferable skills	Offset is also to be used for developing transferable skills such as coaching, mentoring, community teambuilding and training	R14 and R15
Partner selection	Selection of partners with appropriate skills, knowledge, and experience in the defence sector	R2, R9, R10 and R16

5. CONCLUSION

In conclusion, this paper examined how offsets and IC enhance human capability in Malaysia's defence and security sector using the MINERVA framework. It identified critical success factors such as clear planning, robust stakeholder engagement and localisation to facilitate knowledge transfer essential for defence industries. The study suggested that with targeted policy adjustments and clear, measurable objectives, offset can significantly contribute to building a resilient defence workforce, aligning with national educational and industrial goals to enhance defence spending efficacy.

The authors, leveraging their extensive experience in offsets and HCD for the industrial sector, presented key recommendations. They emphasised that building HCD should not solely be the responsibility of the government but should involve a collaborative public-private partnership. Efforts to enhance capabilities in the defence industry and related sectors should extend beyond offset funding and should not be viewed as one-off activities. Success in this area requires a holistic and robust HCD strategy, supported by careful planning and execution. Moreover, it is crucial to identify skill gaps and develop specific guidance and tools to establish human capability effectively. Nations should explore various funding sources and policy mechanisms through broader public sector regulators and in collaboration with the private sector to ensure continuous HCD programmes that foster sustainable human capability building. The key is to align the HCD offset objectives of the key stakeholders the buyer government with the OEMs' long-term strategic objectives.

Regarding offsets, it is insufficient to merely offer higher incentives for HCD programmes. There is a need for clarity, detailed planning and an implementation roadmap that funders should be able to readily access. The current offset models are often ad-hoc or reactive, leading to ineffective and short-term outputs. Instead, a proactive offsets policy with a clearly defined strategic intent will deliver long-term HCD strategies and significant impacts. For this, the offset policy should also align with the national HCD plan. Emerging evidence highlights the positive impact of offset spending in the Kingdom of Saudi Arabia through the advanced implementation of a mature HCD model. As a result, opportunities to earn offset credits through training and education are identified at the earliest stages of procurement. These opportunities are then incorporated into proposals and contracts, leading to tailored support that delivers optimal human capital outcomes for companies. This integration ensures that human capital considerations are embedded into contracts from the outset. It fosters the transfer of knowledge and skills, while also promoting the localisation of education and training. This approach incentivises specific behaviours and addresses human capital barriers to investment. By adopting this proactive HCD model alongside the offset or IPP model, the Kingdom is positioning itself as an attractive investment destination.

However, the research has limitations. The concept of capability, especially human capability for sustainability, requires further exploration in the defence and security context. The model itself needs testing with different empirical data sets, as it was developed primarily using Malaysia, a middle-income country with modest defence spending. Access to stakeholders was limited, affecting the sample population. Detailed empirical analyses from a larger dataset would validate the MINERVA framework. Cross-case analysis comparing different projects is also needed but accessing sensitive data across diverse defence sectors poses challenges. Nonetheless, as the first study on using offsets for HCD, specific country case studies can refine the model for broader applicability. Further research and policy refinement are essential to ensure offset support sustainable HCD, enhancing national security in a complex global environment (Eisenhardt, 1989; Yin, 2018).

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