UNDERSTANDING THE LEARNING THAT OCCURS THROUGH UP-SKILLING OPPORTUNITIES AND PRACTICES IN THE MARINE SECTOR OF SOUTH AFRICA

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ABSTRACT

South Africa is characterised by cultural and biological diversity which constitute a unique context in which to conduct educational research, such as this doctoral study looking at human capital development in the marine biodiversity context. The drive for transformation in the country is also a major factor to consider when researching any sector of the economy, in this case, the biodiversity sector. The biodiversity sector includes organisations involved in biodiversity conservation, research and management. Previous research in the sector has found a clear need for well-thought out workplace skills plans within conservation and research organisations. The national Biodiversity Human Capital Development Strategy that was produced in 2010 by the South African National Biodiversity Institute outlines how all the organisations involved in the biodiversity sector of South Africa need to participate in strengthening the sector through a range of human capital development strategies. This includes extending the existing human capacity of managers and scientists who are already in the workplace, i.e. up-skilling. In particular, 'scarce' skills, as identified by the national Environmental Sector Skills Plan need further attention and development. The scarce skills relevant to this study are: protected area managers; ecosystem managers and post-graduate researchers, hence the focus on managers and scientists in this research.

The marine sector falls within the biodiversity sector and it faces multiple conservation challenges which are complex and it is therefore essential to have skilled and capable managers and scientists in place. By investigating the up-skilling opportunities and practices available to these marine professionals, the goal is to understand if and how learning takes place in the marine sector of South Africa. The main research question of this study is: How do up-skilling opportunities and practices enable learning in, through and for the workplace, by marine professionals? In addition, three sub-questions provide finer details and introduce the central concepts of the research:

I. What up-skilling opportunities and professional practices exist in or for, marine research and conservation organisations and how are they constituted and enacted via practice-based sayings, doings and relatings?
II. How do the individuals learn and exercise their agency within the socio-material realities of the marine scientific and management context, through making use of up-skilling opportunities that are both formal (e.g. course based) and informal?

III. How do generative mechanisms shape the constitution and enactment of up-skilling opportunities and practices, and the learning and agency of marine professionals (scientists and managers)?

The theoretical work of this study consisted of, first, considering sensitising concepts which included: defining skill and knowledge; considering what an up-skilling opportunity might look like; workplace learning (both formal and informal learning); professional practices, lifelong learning or adult education, and agency in the workplace. Critical realism was then employed as the meta-theory that underlabours this research, while the substantive theories used for analysis purposes were socio-materialism and practice theory. Of course, critical realism is a socio-material theory itself, and Bhaskar's four-planar social being or Social Cube was used to interpret and synthesise the findings in the data chapters.

The methodological framework of this study explores the implications of critical realism for research design and analysis and includes a contextual profiling phase, semi-structured interviews, analysis of documents and peer-reviewed papers, as well as observations. There are nine case studies that form the focus of this research and in total 18 research participants were involved. Data analysis included abduction and retroduction as the primary modes of inference and the main analytical tool was the framework of practice architectures where I took the 'sayings', 'doings' and 'relatings' as themes. Further themes were developed from the other relevant theories used in this study; hence socio-materialism, learning, agency, and formal and informal opportunities, were also used as themes when coding the data. Issues around validity, ethics and reflexivity are key elements of the research design and were carefully considered throughout the research process. The principal data chapters are structured in such a way that each sub-question is considered and ultimately the findings are presented in the form of generative mechanisms which included: the politics of social transformation and knowledge as a driving force of up-skilling; the influence of individual disposition and passion or will; the importance of the socio-material realities and realistic expectations; and how relationality is critical for the marine sector. Agency was a cross-cutting theme in all the discussions around learning, practices and the role of the material, and was highly influential on the mechanisms that have been described in this study.

The experiences, events and mechanisms that were uncovered in this research provide insight into the forms of learning as these relate to up-skilling that occur in the marine sector, as well

as the complex relationships between formal and informal learning. The professional practices that occur in the everyday working lives of the marine professionals were shown to be an integral part of the learning process, while formal, certified opportunities are important for strengthening the field and building conservation competence in the country. By uncovering the deeper structures and mechanisms that have power and causal efficacy when it comes to up-skilling opportunities, learning and professional practices, this study has contributed to the field of environmental education as it shows how up-skilling processes operate in complex formations that involve formal and informal learning processes in workplaces. The study also offers a more nuanced view of the relational objects in this field, such as up-skilling and workplace learning, via the inclusion of a socio-material analysis. Through a theoretical and methodological framework that focused on the material using the tools of practice theory and Bhaskar's depth ontology and four-planar social being (to synthesise and interpret the findings from a critical realist perspective), this research highlights the unique context of up-skilling opportunities and practices in the marine sector and reveals the crucial role of agency in workplace practices. This leads to a better understanding of the up-skilling opportunities and practices of marine professionals in South Africa, which ultimately contributes towards improved human capital development in the biodiversity and environmental sectors. Through offering more complex insights into the forms of learning and up-skilling, as well as a distinct methodological contribution, this research has broader relevance for workplace learning research.

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List of Acronyms

BEE	Black Economic Empowerment
CATHSSETA	Culture, Arts, Tourism, Hospitality and Sports Sector Education and Training Authority
CPUT	Cape Peninsula University of Technology
CV	Curriculum Vitae
DAFF	Department of Agriculture, Forestry and Fisheries
DEA	Department of Environmental Affairs
DEAT	Department of Environmental Affairs and Tourism
DHET	Department of Higher Education and Training
DPSIR	Drivers-Pressures-State-Impact-Response
EEZ	Exclusive Economic Zone
EIA	Environmental Impact Assessment
EKZNW	Ezemvelo KZN Wildlife
EMI	Environmental Management Inspectorate
ESSP	Environmental Sector Skills Plan
ETDP SETA	Education Training and Development Practice Sector Education and Training Authority
GIS	Geographic Information Systems
HCD	Human Capital Development
HCDS	Human Capital Development Strategy
HR	Human Resources
HRD	Human Resource Development
HSRC	Human Science Research Council
IUCN	International Union for Conservation of Nature
KPI	Key Performance Indicators
KZN	KwaZulu-Natal
LGSETA	Local Government Sector Education and Training Authority
MCEN	Marine and Coastal Educators Network

MPA	Marine Protected Area
NEMA	National Environmental Management Act
NGO	Non-Governmental Organisation
NMDP	New Managers' Development Programme
NMU	Nelson Mandela University
NRF	National Research Foundation
NSDS	National Skills Development Strategy
NQF	National Qualifications Framework
OECD	Organisation for Economic Cooperation and Development
ORI	Oceanographic Research Institute
PhD	Doctor of Philosophy
PDP	Personal Development Plan
RPL	Recognition of Prior Learning
RSA	Republic of South Africa
SA	South Africa
SAAMBR	South African Association for Marine Biological Research
SADC	Southern African Development Community
SAEON	South African Environmental Observation Network
SAIAB	South African Institute for Aquatic Biodiversity
SAMSS	Southern African Marine Science Symposium
SANBI	South African National Biodiversity Institute
SANCOR	South African Network for Coastal and Oceanic Research
SANParks	South African National Parks
SAQA	South African Qualification Authority
SCLP	Short Course Learning Programme
SETA	Sector Education and Training Authority
SST	Sea Surface Temperature
THETA	Tourism Hospitality and Education Training Authority
TMSA	Transformational Model of Social Activity

UCT	University of Cape Town
UKZN	University of KwaZulu-Natal
UN	United Nations
UNCSD	United Nations Conference on Sustainable Development
UNEP	United Nations Environment Programme
UNEP WCMC	United Nations Environment Programme World Conservation Monitoring Centre
UNISA	University of South Africa
WESSA	Wildlife and Environment Society of South Africa
WIO-COMPAS	Western Indian Ocean Certification of Marine Protected Area Professionals
WIOMSA	Western Indian Ocean Marine Science Association
WWF	World Wide Fund for Nature
WWF-SA	World Wide Fund for Nature – South Africa
WWF-SASSI	World Wide Fund for Nature – Southern African Sustainable Seafood Initiative

CHAPTER ONE – Introduction

1.1 The need for up-skilling in the Biodiversity sector of South Africa

This doctoral study was conducted in response to the identified need for up-skilling and capacity building programmes in the biodiversity sector of South Africa. The core national document this research draws on, and that identified this need for up-skilling, was the Human Capital Development Strategy (HCDS) for the Biodiversity Sector published in 2010 in partnership with the South African National Biodiversity Institute (SANBI) and the Lewis Foundation. A second core document for this research, also published in 2010, was the Environmental Sector Skills Plan (ESSP) for South Africa which was put together by the Department of Environmental Affairs and is closely aligned with the Biodiversity HCDS but addresses skills needs at a broader level and across sub-sectors in the environmental sector. In addition to these two documents, this research was guided by the Culture, Arts, Tourism, Hospitality and Sport Sector Education and Training Authority (CATHSSETA) Sector Skills Plan (DHET 2012). It should also be noted that this research was supported by CATHSSETA as they are tasked with skills development for conservation bodies and agencies such as SANBI, SANParks (South African National Parks), semi-independent provincial agencies and local government, including the Department of Environmental Affairs. Further support was provided by GreenMatter, which is a foundation-funded initiative that is supporting the implementation of the Biodiversity Human Capital Development Strategy.

The Biodiversity Human Capital Development Strategy was shaped by two previous policies: the National Biodiversity Framework (DEAT 2007) and prior to that, the National Biodiversity Strategy and Action Plan (DEAT 2005). These national policies outlined the need for a capacity building programme within the biodiversity sector to assist in addressing the transformation agenda of South Africa. In conjunction with the abovementioned documents, the Biodiversity Human Capital Development Strategy was also informed by previous research conducted by the Human Sciences Research Council (HSRC) in 2009. This research included a situational analysis, a supply and demand side analysis and a gap analysis. These were based on desktop reviews, interviews with biodiversity managers and senior human resource practitioners in a statistically defendable sample of organisations across the sector, and a small number of workplace skills plans (SANBI /Lewis Foundation 2010). The Human Sciences Research Council pointed out that their study, in particular the gap

analysis, was inhibited by the limited availability of data and the poor quality of some of the data, which they suggested was due to the 'invisibility' of the biodiversity (and broader environmental) sector in official statistics and the differences in job titles used across organisations. These factors, along with the limited availability of well-thought out workplace skills plans within organisations and the obvious gaps in skills-related information in general, led to the recommendations that appear in the Biodiversity Human Capital Development Strategy and thus, to research projects such as this one.

The previous research into the biodiversity sector, mentioned above, indicates the importance of understanding how the biodiversity (or conservation) sector is positioned on a national level and who the key stakeholders are in the sector. The Biodiversity Human Capital Development Strategy recognised that all organisations involved in biodiversity conservation, research and management in South Africa need to participate in strengthening the sector (SANBI/Lewis Foundation 2010). To do so, adequate human capital (or human capacity)[1] is required and the relevant Sector Education and Training Authorities are expected to address this by taking guidance from the third National Skills Development Strategy (NSDS III) and prioritising their skills development planning. The organisations mentioned above, however, are dispersed across various Sector Education and Training Authorities and as the Human Sciences Research Council (2009) study suggested, the biodiversity sector is not clearly defined. An example of the dispersed nature of biodiversity organisations is the provincial conservation authority, Ezemvelo KZN Wildlife, which is registered with CATHSSETA but has also had to form an association with the Security SETA (Ramsarup 2017). Another organisation, WESSA (the Wildlife and Environment Society of South Africa) is registered with the Education and Training and Development Practice Sector Education and Training Authority (ETDP SETA) because of the training programmes they offer, as well as CATHSSETA and the Local Government Sector Education and Training Authority. Other relevant Sector Education and Training Authorities in the biodiversity and environmental sectors include the Agricultural SETA and the Energy and Water SETA. It can thus be said that neither the environmental sector, nor the biodiversity sector, have a dedicated Sector Education and Training Authority to drive skills development and these sectors are relatively broad and cross-cutting. The Environmental Sector Skills Plan (ESSP) and the Biodiversity Human Capital Development Strategy help to

[1] The term 'human capital' is somewhat problematic when used in the biodiversity sector, due to the sector not being a commercial one, however, I explain how the concept of human capital is used in this research, in Chapter Two, Section 2.2: What is 'skill' and what does it mean to up-skill?

clarify the boundaries of the biodiversity sector in South Africa and in doing so, allow for further exploration of the skills, or human capacity needs, of the sector.

The Biodiversity Human Capital Development Strategy uses the term "operation upgrade" (SANBI/Lewis Foundation 2010, p.36) with regard to the skills needed in the sector and it lists one the strategic objectives of the strategy as "extending the existing capacity by improving the skills of those already in the workplace" (SANBI /Lewis Foundation 2010, p.54). It discusses the development of new workplace-based up-skilling programmes that improve staff skills with the hope of instilling a sense of belonging of staff already in the sector. Both the Biodiversity Human Capital Development Strategy and the Environmental Sector Skills Plan for South Africa make reference to the apparent skills-gap and through looking at vacancy rates together with other data, the Environmental Sector Skills Plan identified scarce and critical skills in the sector. The Environmental Sector Skills Plan also aimed to provide guidance on improving environmental sector skills development planning and implementation within the national education, training and skills development system. In South Africa, the discourse around transformation in workplaces and the discussions around 'the skills crisis' or 'skills shortages' are not unique to the biodiversity sector and have been common since the end of apartheid, when bold new education and training strategies were implemented in South Africa (Cooper & Walters 2009), and when the need for transforming the profile of employees (from a largely white high skill workforce to include black South Africans) became a key priority for the new state. This discourse and the associated challenges surrounding transformation are taken further in the Biodiversity HCDS and the ESSP when they recommend up-skilling programmes that should improve staff skills in such a way that values of social equity are included. Similar sentiments appeared in the White Paper for Post-School Education and Training, which emphasises the importance of "on-the-job training" (DHET 2013, p. xvi) and it suggests that the Sector Education and Training Authorities need to focus on developing the skills of those in existing enterprises. It is for this reason that CATHSSETA provided initial funding for this doctorate, along with a number of other post-graduate research projects, looking at the different stages of an individual's pathway through school, higher education and the workplace, within the biodiversity sector.

The abovementioned White Paper for Post-School Education and Training also makes the point that the Sector Education and Training Authorities are "key institutions in the effort to bridge education and work" (DHET 2013, p.56) and that through sector-specific skill

interventions, they should be working towards achieving the goals set out in the National Skills Development Strategy of which the third National Skills Development Strategy (NSDS III) was brought out in 2011.[2] The commitment to transformation and up-skilling can be seen in this strategy's mission, which is:

> To increase access to high quality and relevant education and training and skills development opportunities, including workplace learning and experience, to enable effective participation in the economy and society by all South Africans and reduce inequalities. (DHET 2011, p.6)

The strategy also recognises that when structural change occurs, too often the outcome is retrenchments rather than retraining and redeployment of employees (DHET 2011). Furthermore, the strategy acknowledges a tendency to overemphasise lower level skills when considering skills development opportunities and makes explicit the need for more substantial programmes that support career pathing and that enable greater flexibility and mobility in workforces, in general (ibid.). This is where the Biodiversity HCDS comes into play, as it focuses on high level skills. The rationale behind this focus is due to the strong national vision of transformation in the form of racial redress and gender equity at senior levels. Given South Africa's history, these aspects of social equity cannot be ignored and the Biodiversity HCDS points out that when it comes to leadership roles in the biodiversity sector, the majority of these positions are filled by white men (SANBI/Lewis Foundation 2010). It was also found that there are high turnover rates at the management levels and biodiversity organisations find it most difficult to retain senior staff or professionals, when faced with competition from other sectors, commercial companies and other organisations. Consequently, this doctoral research focuses on professionals, senior managers and principal scientists with the hope of providing an informed response to the issues described above.

1.2 Understanding the Marine Sector within the broader field of conservation in South Africa and the Biodiversity Sector

This research considers the marine sector a sub-branch of the biodiversity sector[3] which includes all marine and coastal environments of South Africa. The South African coastline is characterised by varied habitats and rich species diversity, for both marine fauna and flora. The marine biota recorded in South Africa in 2016 stood at 12 914 species, which represent 15 % of the world's

[2] At the time of writing (November 2018) a review of NSDS III is underway (Ramsarup, pers comm. 2018).
[3] The *maritime* industry of South Africa is taken as a separate entity and is not included in the scope of this study.

total and these include a number of important flagship species such as the wandering albatross, the blue whale and the endangered great white shark (WWF-SA 2016). The coastline has very few natural harbours but has distinct biozones that range from the coral reefs of northern KwaZulu-Natal to the cool-water kelp forests of the Northern Cape (DEAT 2009). There are also some 343 estuaries along the South African coast, the majority of these on the wetter Indian Ocean coastline (Griffiths et al. 2010) and a little more than half of the coast is made up of sandy shores, while the rest are mainly rocky (WWF-SA 2016). In total, the South African coastline is 2798 kilometres long and approximately 30 % of South Africa's population live within 60 kilometres of the coast. While Figure 1.1 shows the general positioning of South Africa, its extensive coastline and its provinces (four of which are coastal), Figure 1.2 clarifies the maritime boundaries of the country and shows the ocean currents that influence the species diversity and richness of the country's coastal waters. The Exclusive Economic Zone (EEZ) is the area stretching 200 nautical miles from the coast where countries have jurisdiction over the natural resources (WWF-SA 2016). It has been estimated that marine ecotourism contributes as much as 400 million Rands to the South African economy annually and the indirect value of the contribution is over two billion Rands (DEA 2015).

The marine sector of South Africa is shaped by the facts presented above and much of what occurs in the sector is centred around the natural resources that are found within in the EEZ. The sector faces multiple and complex conservation challenges which will be discussed in the following section, but it should be noted that these challenges make it essential to have skilled and capable managers and scientists in place, as well as relevant professional development opportunities for them.

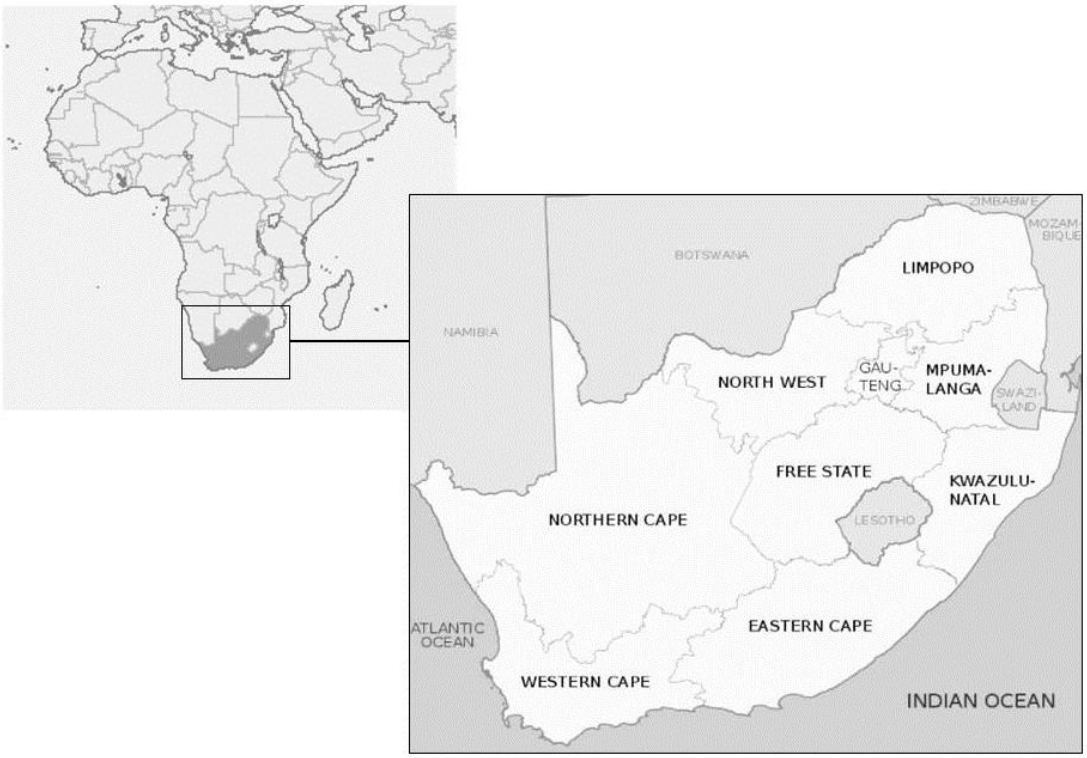


Figure 1.1: Map to show the general positioning of South Africa, the extensive coastline of the country as well as the relevant coastal provinces

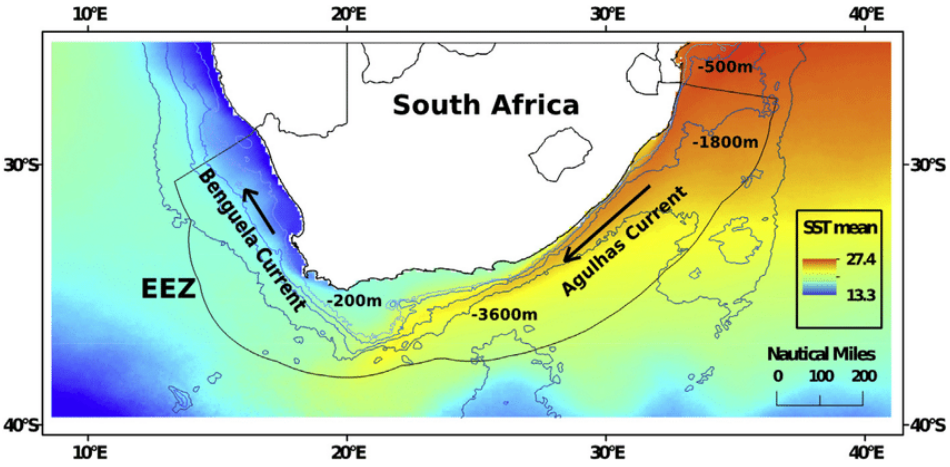


Figure 1.2: The maritime boundaries of South Africa and the ocean currents that occur within the Exclusive Economic Zone (EEZ). The average Sea Surface Temperatures (SST) are also shown.

1.2.1 The state of South Africa's marine and coastal environments

Internationally, over the last two to three decades, there has been heightened awareness of marine and coastal issues and thus an increase in research into this field. Conservation managers,

researchers and scientists are becoming increasingly concerned about the pressure on fish stocks and the sustainability of fisheries, considering the growing global demand for animal protein, particularly fish. In addition, a major concern for any country with a coastline or with people who depend on the ocean for their livelihoods is the effects of climate change and how changes in sea temperature will affect the entire oceanic food-web. In response to these possible future scenarios, much work is needed on how to mitigate the negative effects these changes may have. This requires knowledgeable professionals who are equipped with the right skills for taking on these challenges in a holistic, sustainable manner. South Africa is not unique in this regard and in Section 1.2.2 below, the specific skills that are needed are discussed in relation to the policies that affect the marine sector. Prior to that, it is important to consider the general state of South Africa's marine and coastal environments and some of the key challenges faced by these ecosystems will be discussed.

In South Africa, the largest industrial fisheries are the pelagic (pilchard and anchovy) and demersal (hake) sectors, which are focused on the west and south coasts (Griffiths et al. 2010). On the east coast, however, there is a high coastal population and although there are smaller commercial fisheries, the over-exploitation of the inshore resources such as coastal fish and invertebrates, is most problematic (ibid.). With an ever-growing human population both in South Africa and globally, there is great incentive to find sustainable methods of harvesting the resources of the coasts and oceans and managing these ecosystems in such a way that human impact is minimal (DEAT 2009). The diversity of marine species along South Africa's coastline is closely matched by a diversity of challenges that involve complex and intertwined socioecological systems. A report by the World Wide Fund for Nature-South Africa (WWF-SA) published in 2016, re-iterates that "illegal and historical overfishing has decimated many of the once abundant inshore fish stocks, the price of which is now being paid by our coastal communities who have lost not just their livelihoods but a way of life" (WWF-SA 2016, p.2). The report also points out that there are now offshore threats too, such as bulk sediment mining of the seabed and fossil fuel exploration that is not sufficiently regulated and these "pose significant and poorly understood risks to entire ecosystems and associated industries" (WWF-SA 2016, p.2).

In 2005, SANBI and the Department of Environmental Affairs and Tourism published the National Spatial Biodiversity Assessment as part of the National Biodiversity Strategy and Action Plan and this was the first time South Africa's biodiversity had been comprehensively mapped

and assessed (Driver et al. 2005). The assessment dealt with terrestrial, freshwater, estuarine and marine environments and aimed to identify priority areas where conservation action was needed. The impacts on the marine biozones in that report were listed as:

- Extractive marine living resource use
- Pollution (including oil pollution, shipping-related pollution and many sources of pollution deriving from inland land uses)
- Mining
- Coastal development
- Climate change
- Alien invasive species
- Non-extractive recreational activities (such as off-road vehicles and boat-based tourism)
- Mariculture (although this does not necessarily have a negative impact it needs to be carefully managed)
- Catchment and management issues (including over-abstraction of freshwater and siltation)

(Driver et al. 2005)

Of these impacts, the most widespread and critical was the extractive marine living resource use, with mining (especially along the west coast) with pollution having the next highest impact on the country's marine biodiversity. Overall, the report concluded that the status of South Africa's marine ecosystems was "less dramatic than for rivers or estuarine ecosystems, but worse than for terrestrial ecosystems" (Driver et al. 2005, p.33). It also argued that some of the impacts of extractive marine living resource use are reversible if over-harvesting of marine resources is stopped. However, there are also irreversible impacts such as fishing practices that damage habitats (for example, trawling the seabed) and in certain biozones of the country, this is of great concern.

It is most likely due to the abovementioned impacts on marine living resources that the 2016 WWF South Africa report largely focuses on fisheries and fish stock statuses as well as the effect on coastal communities and the country's economy. The report took the innovative approach of developing ocean 'scorecards' which summarise the key challenges faced by South Africa's oceans and it presents a grading of the level of concern for each issue. The levels of concern were depicted as green, orange and red and specific criteria were used for each challenge, to determine the status, or level of concern. Green was considered to be the ideal situation and the most sustainable situation, while red meant much improvement was needed (it follows that orange was

in between, where the status needed improving but was not necessarily at a critical level). The key issues included coastal livelihoods, sustainable seafood, implementation of an ecosystem approach to fisheries, marine spatial planning and illegal, unreported and unregulated fishing (WWF-SA 2016). The only one of these issues that was 'green' (or seen as being adequately addressed) was the sustainable seafood issue and this is mostly due to the work being done by WWF-SASSI (the Southern African Sustainable Seafood Initiative).[4]

The issues that scored 'orange' were an ecosystem approach to fisheries and marine spatial planning, while coastal livelihoods and illegal, unreported and unregulated fishing, scored 'red'. Although not all these issues can be dealt with in detail in this section, it is worth mentioning that many of the challenges around coastal livelihoods stem from the small-scale fisheries policy that was gazetted by the Department of Agriculture, Forestry and Fisheries (DAFF) in 2012. This policy was supposed to redress the exclusion of traditional/artisanal fishers from the commercial fishing sector and improve co-management initiatives (WWF-SA 2016). However, with diminishing marine resources, increasing criminalisation and conflicts around rights allocations, there has been little progress and the governance challenges faced by this sector are significant (ibid.). The broader, national policies are discussed in the following section, as well as the skills needed in the marine sector, but from the challenges and key issues that have been touched on here, it is obvious that state of South Africa's marine and coastal environments is indeed complex and involves many intertwined issues, many of which need a great deal of attention. Prioritising the types of skills, competencies and knowledge required to meet these challenges is not a simple procedure and thus the necessity for research into up-skilling in the marine sector.

1.2.2 Relevant skills and policies in the marine sector of South Africa

The Environmental Sector Skills Plan (ESSP) for South Africa put forward the concepts of scarce and critical skills in the biodiversity sector and explored the issues surrounding these terms. As defined by the Department of Labour, 'scarce skills' are occupations in which there is a scarcity of qualified and experienced people, currently or in the future (DEA 2010). The levels of scarcity range from *absolute*, where appropriate people are not available, to *relative*, where these people are available but do not meet the exact employment criteria. The term 'critical skills' is used to describe competencies that are required in and essential to, a certain

[4] WWF-SASSI works with consumers, retailers, seafood suppliers and restaurant chains to encourage awareness around the sustainable sale and consumption of seafood in South Africa.

occupation. When considering up-skilling in the marine sector, examples of the relevant skills that may be required include:

- the knowledge of and ability to work with a growing array of policies and legislation;
- social learning facilitation, communication skills;
- knowledge brokering and advocacy in political, economic and other social contexts. (SANBI/Lewis Foundation 2010, p.35)

Among others, the abovementioned skills play a key role in the daily lives of the professionals in the sector, all while taking into account the conservation concerns outlined earlier. Some of the scarce skills listed by the Biodiversity HCDS are: protected area managers (relative scarcity); ecosystem managers and post-graduate researchers (absolute scarcity) (SANBI/Lewis Foundation 2010, p.36). In the biodiversity sector, these occupations can relate to the marine, coastal or estuarine environments, as well as the more well-known terrestrial ecosystems.

In South Africa, environmental policies take a people-centred approach to sustainable development and incorporate the role of humans in the environmental concerns within the country's borders. The Biodiversity HCDS points out that "new legislation creates new skills demands" (SANBI/Lewis Foundation 2010, p.22) and it is for this reason that the policies surrounding not only the marine environment, but also the human capital requirements and skills development strategies, need to be considered when doing research into up-skilling in this sector. The overarching policy concerning the environment and conservation in South Africa is the National Environmental Management Act (NEMA), Act 102 of 1998 (RSA 1998a). Concerned specifically with the marine and coastal environment, the relevant policy was passed in the same year as the NEMA, namely the Marine Living Resources Act (Act 18) (RSA 1998b), which saw the official establishment of marine protected areas (MPAs). Over the years the number of MPAs along the country's coastline has grown and in October, 2018, another 20 MPAs were approved. Once finalised, this will bring the total to 45 (which equates to protection levels of 5% of the Exclusive Economic Zone (EEZ)). The Marine Living Resources Act saw a surge in the demand for skills relating to management of the MPAs and additional research was required into the benefits or constraints of these areas. Ten years later, in 2008, the Integrated Coastal Management Act (Act 24 of 2008) (RSA 2008) was passed and this Act once again had an impact on the skills needed for dealing with marine

and coastal development applications and as well as estuary management (SANBI/Lewis Foundation 2010).

It is clear that the types of skills and competencies required in the marine sector are varied and multi-faceted. Depending on the organisation, its mandate and the professionals operating within the organisation, different skills or knowledge may be prioritised. For instance, management skills may be the top priority, or possibly the technical skills of attending to a coastal development application. However, due to the many issues present in the marine sector; a competent professional will have to deal with challenges ranging from the effects of climate change, such as sea level rise, habitat protection and endangered species preservation, to public access to the coast and ocean, and issues around water quality. In addition, and as has been discussed above, the over-use of coastal and marine resources is becoming an ever-more pertinent concern and managers and researchers need to deal with over-exploitation at both commercial and subsistence levels. In many cases, law enforcement is also a vital skill for managers in the marine sector and this leads back to knowing and understanding the relevant policies for the marine and coastal environments as well as the necessary physical capabilities to carry out patrols and possibly even make arrests. Law enforcement is often complicated by factors such as the extensive, often difficult to access, coastline of South Africa, or the overlapping jurisdictions of these coastal areas (DEAT 2005).

Public awareness and community involvement is yet another aspect to consider when focusing on the skills needed by a marine professional. The sign board below (Figure 1.3) is one example of awareness being created in a public place, in this case by the Department of Agriculture, Forestry and Fisheries and relating to the benefits of MPAs. Education initiatives in coastal towns and communities are another method of creating awareness and for these events, communication and logistical skills are essential. Community involvement often includes dealing with the issues surrounding the small-scale fisheries policy that was mentioned earlier and conflict resolution is commonly needed in these situations. The importance of MPAs will become more apparent in the following sections of this chapter but thus far it has been shown that the interaction between skills, policies and conservation concerns are multiplex and the human capacity in the marine sector needs to match these intricate interrelations.

Figure 1.3: Permanent sign boards at the coast are one means of creating public awareness and they help in educating the communities that use these areas

1.2.3 The MPA management training course and MPA-related skills

The World Wildlife Fund/South Africa (WWF-SA) has been an instrumental organisation when it comes to conservation in the country over the last 40 years and they have played an important role in recognising and responding to the challenges surrounding MPAs in South Africa. These challenges include: a shortage of skilled MPA management staff, an overall lack of funding to the sector (WWF 2015), and a lack of "specific MPA management training available in South Africa" (Tunley 2009, p.11). The lack of specific training was originally outlined in a report done in 2003 by Lemm and Attwood and in response, WWF-SA commissioned the development of the Marine Protected Area Management Training Course in 2004. Developed by Rhodes University, and with support from the Marine and Coastal Management sub-directorate of the National Department of Environmental Affairs and Tourism (which is now called 'Oceans and Coasts' and is part of the Department of Environmental Affairs), this training course trained 90 professionals in MPAs between 2005 and 2010 (Squillante et al. 2010) and between 2012 and 2016, a further 91 individuals successfully passed the MPA training (Adams, pers comm. 2018). Initially the course was conducted over six to nine months, comprising contact sessions of three-four days and covering eight modules which included topics such as MPA legislation, management

planning for MPAs, marine ecology and engaging with stakeholders (Tunley 2009), amongst others. Since the MPA training course's conception, it has gone through multiple revisions, often coinciding with new laws and policies and the development of new issues that needed to be addressed. More recently, WWF-SA and Oceans and Coasts are offering the MPA introductory course annually, which is a week-long training course for MPA managers, run by specialists and training partners (WWF 2015). There is also an annual MPA Forum which brings together approximately 100 MPA stakeholders from throughout the country, for four days, and presentations and discussions deal with improving collaboration, sharing knowledge and current MPA management challenges (ibid.).

In 2012 a case study was conducted on the full (six-nine month) MPA training course by a Master's student at Rhodes University. This student looked at the competence development in MPA professionals by taking an interpretive approach and reviewing course materials and design, as well as interviewing course participants (Lewis 2012). The study was largely based on the 2003 report by Lemm and Attwood and aimed to identify how the course produced competences that were appropriate to the workplace settings of the participants (Lewis 2012). The conclusions reached by the study were that the course was well-designed to address issues in MPA management and key competencies were developed that were relevant to the workplaces of MPA professionals.

However, as previously mentioned, the course has gone through a number of revisions and at times, these revisions were due to issues around accreditation, and often involved adapting the means of assessment for the training course, which may have reduced the overall value of the training. In a presentation at the 2015 MPA Forum, it was raised that "the concept of accreditation has caused more challenges to the MPA Management Training Courses than any other issue" (Fielding & Sisitka 2015). One solution to this problem is working with universities to register the training course as a 'short course' and this is the approach that was originally taken, and is now being considered once again, with the introductory course. The Nelson Mandela University, in Port Elizabeth, South Africa, runs a Short Course Learning Programme (SCLP) and the one-week introductory course in MPA management training is now registered as part of this programme. If the participants complete and pass the assignment at the end of the course, they receive a certificate that is accredited through the SCLP (Fielding, pers comm. 2017). Funding for both the introductory course and the longer,

three-week version of the course, is an ongoing concern and is often the reason for delays or non-occurrence of the courses (ibid.).

Internationally, the first organisation to certify MPA professionals was the West Indian Ocean Marine Science Association, in collaboration with the Coastal Resources Centre at the University of Rhode Island (Sisitka et al. 2013). The programme is called the Western Indian Ocean Certification of Marine Protected Area Professionals (WIO-COMPAS) and provides certification via a suite of assessment tools that give participants a range of opportunities to provide evidence of their skills and experience (Fielding & Sisitka 2015). The following section goes into more detail about this programme.

1.2.4 WIO-COMPAS as model of successful training and accreditation

The WIO-COMPAS programme works with professionals at various levels who work in, or are associated with MPAs, and although it includes professional development, it is not merely a training course, but rather, it is a process for assessing and certifying proven performance on the job and is designed to be adaptable and replicable in other coastal regions of the world (Squillante et al. 2010). The programme offers three levels of certification and these are tailored to the expert skills and specific experience needed to effectively carry out the different job functions of an MPA (WIO-COMPAS Brochure 2010). These levels are outlined below:

Level	Competence Focus	Professionals
1	Marine Field Operations	Ranger and other field staff engaging with communities and enforcing laws
2	Site Management	MPA managers, wardens and section leaders with supervisory roles
3	Strategy, Policy and Planning	Agency directors and managers focused on regional policy and networking of MPAs

(WIO-COMPAS Brochure 2010: see Appendix D)

These certificates are available to MPA professionals of the Western Indian Ocean region and entry is based on years of experience in MPAs, academic achievement and competence. The WIO-COMPAS programme successfully set the standard for other certification and professional development programmes and in addition provided a fully functional model of

Recognition of Prior Learning (RPL) (Sisitka et al. 2013). It also offered opportunities for professional networking and strengthened collaboration between partner organisations in the Western Indian Ocean region and beyond (ibid.). Squillante et al. (2010) pointed out that value-adding, active networks, such as those found in the WIO-COMPAS programme, are rare and overcoming the challenge of getting individuals to share practical tips, tools and their experiences through case studies, is noteworthy. Other obstacles faced by the programme include "persuading management agencies to incorporate the programme and/or its main elements into their human resource systems" (Sisitka et al. 2013, p.4). Employers do not always see the value of the certification process, despite the participants vouching for it. Furthermore, an ever-present challenge is reducing costs, while maintaining the consistency of the programme (Sisitka et al. 2013).

1.3 Up-skilling in a global context: the Blue Economy and human capacity

In 2012 the United Nations Conference on Sustainable Development (UNCSD), also known as 'Rio +20", was held in Rio de Janeiro and one of the key objectives was to advance the concept of the green economy (UN 2014). However, in the lead-up process to this conference, many coastal countries around the world questioned the focus on the green economy and it was suggested that there should be a "Blue Economy" approach (ibid.). With almost half of the world's population living within 60 km of the sea and considering over 70% of the planet's surface is ocean, it is justifiable to recognise the "blue" aspects of sustainable development and economic growth. The African Union's Agenda 2063 also prioritises the creation of blue economies in the future and developing the ocean space is increasingly becoming seen as a means for developing countries to improve their economic growth rates.

In this research I consider the *blue* economy not as separate from, but rather included in the broader concept of the green economy. Thus, one could also discuss how *blue* skills play a critical role in the functioning of such economies, as well as the conservation efforts surrounding the marine sector. The necessity of expert knowledge and specific skills cannot be overlooked when taking an ecosystems approach, where the utilisation of marine and coastal resources for economic gain and improved human well-being must go hand-in-hand with sustainable development and sound management of the natural resources associated with the ecosystems in question. In this case, the knowledge and skills will surround not only the extraction of resources, but also the management of marine protected areas (MPAs). These MPAs play an integral part in

the sustainability of the blue economy and over the last decade there has been an international call for an increase in the number and size of MPAs. However, many of the already-existing MPAs lack effective management and are often understaffed or the employees do not have the full range of required skills (Squillante et al. 2010). In 2013, the IUCN and the UNEP World Conservation Monitoring Centre (UNEP WCMC) reported that 2.8% of the global ocean was protected and considering 12% of terrestrial areas are under protection (UN 2014), this situation is far from ideal. Marine protected areas not only lack the human capital and associated competencies, but too often there are no established standards of performance for guiding professional development (Squillante et al. 2010). The WIO-COMPAS programme is one of only a few initiatives that identifies and standardises the skills and competencies needed in an MPA and by doing so, it helps in developing more effective MPA management (ibid.).

South Africa has also recognised the economic potential that the ocean holds and in July 2014, a programme was launched by the government, namely the Oceans Economy Lab of Operation Phakisa.[5] This presidential initiative aimed to unlock the abovementioned economic potential of the marine and coastal environments and the goal was to fast-track the delivery of some of the development priorities outlined in the National Development Plan. A number of critical areas of the oceans economy were identified as follows:

- Marine transport and manufacturing
- Offshore oil and gas explorations
- Aquaculture
- Marine protection services and ocean governance

The fourth area listed here includes a proposal for a National Marine Spatial Planning Framework as well as the development of a network of MPAs (Sink 2016). This research into up-skilling is mainly concerned with this area of Operation Phakisa and particularly the human capacity required for such a MPA network. Operation Phakisa is discussed in Chapter Five when presenting the findings from the semi-structured interviews but when I speak of the marine sector of South Africa, the wider perspectives of the global context and the 'blue' economy should be kept in mind. The worldwide movement towards more of a focus on the oceans and the coastal environments plays a significant role in shaping the marine sector of South Africa and as a country surrounded by a vast ocean and with such high biodiversity, this aspect of the research is essential.

[5] Operation Phakisa website: http://www.operationphakisa.gov.za/operations/oel/

1.4 Research goals

The overarching goal of this study is to understand if and how learning takes place through up-skilling opportunities and professional practices, in the marine sector of South Africa. I hope to:

a. Provide insight into the forms of learning that contribute to up-skilling and professional development practices within and around workplaces;

b. Gain an understanding of the relationship between formal up-skilling opportunities and informal learning;

c. Contribute ideas that can lead to improved practices in marine conservation workplaces.

Ultimately I hope to inform the Biodiversity HCDS implementation and assist the relevant Sector Education and Training Authority (CATHSSETA) in making decisions through this research, with the wider interest in enabling access, retention and participation in this sector as outlined in the Biodiversity HCDS (SANBI/Lewis Foundation 2010).

1.5 Research questions

To explore and gain an in-depth understanding of the issues surrounding up-skilling, professional practices and learning in the biodiversity sector, and specifically the higher level skills in the marine sector, the following research question was developed:

> **How do up-skilling opportunities and practices enable learning in, through and for the workplace, by marine professionals?**

Using the sub-questions outlined below I delve further into the concepts associated with the above research question and these sub-questions serve as an outline of how my data chapters will be presented (Chapters Five to Seven).

- What up-skilling opportunities and professional practices exist in or for, marine research and conservation organisations and how are they constituted and enacted via practice-based sayings, doings and relatings? (Chapter Five)
- How do the individuals learn and exercise their agency within the socio-material realities of the marine scientific and management context, through making use of up-skilling opportunities that are both formal (e.g. course based) and informal? (Chapter Six)

- How do generative mechanisms shape the constitution and enactment of up-skilling opportunities and practices, and the learning and agency of marine professionals (scientists and managers)? (Chapter Seven).

1.6 Professional context and motivation for the study

Although my academic career path has been largely based in the natural sciences, I have always maintained a keen interest in education and particularly, environmental education. The role humans play in the natural world is one that cannot be ignored and from a young age I realised that education was the key to conservation of ecosystems. Having completed a gap year at an environmental and outdoor education centre as an activity leader, I went on to do an undergraduate degree and Honours at the University of KwaZulu-Natal (UKZN) in the fields of biology and ecology. When the opportunity arose to do a Master's at Rhodes University in marine biology, I eagerly took it up and proceeded to conduct ecological research on the rocky shores of the south-east coast of South Africa. Despite the theoretical nature of my Master's, the conservationist in me hoped the research would have applications beyond the scope of the research. Ideally, an improved state of the coastline would be the outcome but the research I was involved with did not directly result in this.

However, through my experiences in the field and from attending marine science conferences, I became aware of the many challenges surrounding the marine sector and it was clear to me that there was a need for improved human capital in the sector. Thus, when the call came for applications for research into the biodiversity sector and skills development within the sector, I did not hesitate to apply. With my marine biology background, it was logical that I should look specifically at the marine sector and at professionals within workplaces where the need for up-skilling and transformation was greatest. To me, the importance of having the *right* person in the *right* place was evident and the coming together of CATHSSETA, GreenMatter and the Environmental Learning Research Centre of Rhodes University allowed for doctoral research that addressed this need for human capacity development and up-skilling in the marine sector.

1.7 Introducing the nine case studies of this research

The case studies for this research were selected through a process of contextual profiling that is described in more detail in Chapter Four. The organisations or institutes that were selected all had mandates that were strongly focused on marine and/or coastal environments in one way or

another. In some instances, this meant using a particular branch or department of a larger organisation as a case study and the information presented below describes the mandates and mission statements of all nine case studies. These mandates and mission statements were found on the various websites of the organisations and institutes and all quotes used in the descriptions are taken off the websites (for a complete list of all relevant websites see Appendix A). I start by introducing the two research institutes that were included as case studies and move on to the other seven organisations. The sub-section on SANCOR illustrates the important role of this organisation despite it not being used as a case study.

Case study 1: ORI – Oceanographic Research Institute (SAAMBR)

The Oceanographic Research Institute or ORI falls under the umbrella organisation of SAAMBR, the South African Association of Marine Biodiversity Research. Based in the province of KwaZulu-Natal and located in Durban, this research institute deals with coastal and marine ecosystems, primarily those along the East Coast of South Africa but extending to other parts of southern Africa and the West Indian Ocean. The mission of ORI is "to monitor, sustain and improve the environmental health of coastal and marine ecosystems to the benefit of all". Being a research institute, the employees are predominantly scientists (at varying stages of their academic careers). uShaka Marine World, which is comprised of an aquarium and an education centre, also falls under SAAMBR and their mandate is strongly focused on education. Through the abovementioned divisions, as a whole SAAMBR's mission and vision is to stimulate community awareness of the marine environment through education and promote wise, sustainable use of marine resources through scientific investigation.

Along with their main aim of scientific investigation, the ORI website states that they offer the following:

- Services and capacity building (supervision of post-graduate students, specifically designed training courses for management and conservation agencies);
- Consulting services (impact assessment on marine resources and ecosystems).

Much of this work they conduct with partners and during ORI's 50-year history, they have collaborated with numerous local, regional and international research/academic institutes, as well as government departments and agencies, task groups, working groups and special

committees. The knowledge and skills of the staff at ORI are wide ranging and the participants in the case study had diverse backgrounds. However, as this research is focused on high-level skills, it is not surprising that in this case, all the participants had doctoral degrees and generally they had taken a 'traditional' academic path. More explanation of their careers will be given in Chapters Four to Seven.

At the time of data collection, the expertise at the institute ranged from aquaculture to coral reef ecology as well as estuarine ecology. When considering coastal management, research and conservation, it is essential to include estuarine ecosystems as they are an integral part of the South African coastline. Thus, in all cases, I have included scientists who categorise themselves as estuarine ecologists or have a background in estuary management or conservation.

Case study 2: SAIAB – South African Institute for Aquatic Biodiversity

SAIAB is one of three national facilities of the National Research Foundation (NRF) and falls within their 'Biodiversity' cluster, along with the National Zoological Gardens and the South African Environmental Observation Network, or SAEON. The institute is based in the Eastern Cape town of Grahamstown (recently renamed Makhanda) and their mission is "to serve the nation through the generation, dissemination and application of knowledge to understanding and solving problems on the conservation and wise use of African aquatic biodiversity". As a research institute, the role of SAIAB is first to conduct scientific research that provides information on the aquatic biodiversity for South Africa, the SADC countries and Africa. However they also have a well-established up-skilling programme for young scientists entering the aquatic biodiversity sector. They also manage the National Fish Collection and library.

Although SAIAB focuses on the full spectrum of aquatic environments, they do much of their research in the marine, offshore environment and work closely with the 'Elwandle' Node of SAEON. The Elwandle Coastal Node is mandated to undertake long-term monitoring and research in South Africa's coastal zone and together with SAIAB strive to detect, understand and predict environmental change in the country's coastal ecosystems. In Chapter Four an explanation is given for why SAEON was not included as a separate case study for this research.

Case study 3: DEA – Department of Environmental Affairs: Oceans and Coasts

The Oceans and Coasts branch of the national Department of Environmental Affairs is focused on marine protection services and ocean governance, which entails protecting the ocean environment from all illegal activities as well as the promotion of its multiple socio-economic benefits. This national government department is not only responsible for the management and conservation of South Africa's oceans and coastal environments, but it also oversees the management of the all the marine protected areas (MPAs). These MPAs are mostly managed by provincial conservation agencies and include a range of 'no-take' zones and 'controlled' areas. The biggest of these MPAs is the Prince Edward Islands in the Southern Ocean and it was South Africa's first offshore MPA. DEA-Oceans and Coasts maintain South Africa's research presence on these islands as well in Antarctica through the South African National Antarctic Programme, where scientific data is collected on voyages. These data contribute towards the understanding of the impacts of climate and weather information associated with extreme events.

The Oceans and Coasts branch supports scientific research into oceanography and they encourage further education and training in fields relevant to oceanography. They consider their purpose to be one that involves bringing about "harmony and integration of the various role players in the ocean space but also safeguard against any possible compromise of the ocean environment through application of different legislation relevant to oceans and coastal management." (DEA: https://www.environment.gov.za/branches/oceans_coast, 2017). Their key focus areas include:

- The establishment of management frameworks and mechanisms for the ocean and coastal environment.
- The strengthening of national science programmes for integrated oceans and coastal management.
- The development of and contribution to effective knowledge and information management for the sector.
- The participation and support to international agreements and bodies supportive of SA environmental and sustainable development priorities.

(DEA: https://www.environment.gov.za/branches/oceans_coast 2017).

Case study 4: SANBI – South African National Biodiversity Institute

SANBI lead and coordinate biodiversity research as well as monitor and report on the state of biodiversity in South Africa. They also head up the human capital development strategy of the biodiversity sector and are dedicated to finding best-practice management models in partnership with multiple stakeholders. SANBI aims to bridge science, knowledge, policy and implementation in order to achieve the aforementioned 'best practice'. They run a Marine Programme based in Cape Town and provide the DEA with science-based advice on protected area planning and management, so are focused on data and research surrounding MPAs, and at the time of my data collection they were specifically working on offshore MPAs.

Despite the Marine Programme being made up of a small team, I felt it necessary to include them due to their national influence on the biodiversity sector and their role in advising not only Oceans and Coasts (the relevant branch of DEA) but also the Department of Agriculture, Forestry and Fisheries (DAFF) and the Department of Mineral Resources. SANBI's Marine Programme has a number of key focus areas which include marine biodiversity assessment, monitoring, planning, mainstreaming, information management and science-based policy advice. They are also placed in such a way that they can explore novel or unique approaches to the traditional divides of science, policy and implementation, as well as collaborate with partners and co-ordinate marine sector stakeholders, in the country.

In addition, SANBI has a vested interest in human capital development and this research into up-skilling draws largely on the document that SANBI played a critical role in putting together. They aim to drive human capital development (HCD) in order to: "enable environmental management practices through environmental education, awareness and capacity development processes" (SANBI: https://www.sanbi.org/human-capital-development 2015). Although not all of their HCD programmes directly affect up-skilling in the workplace they contribute to skills development and up-skilling in the sector as a whole. These programmes include: GreenMatter; the Groen Sebenza Programme; and the SANBI internships or studentships/work-integrated programmes (for more information on these initiatives or programmes see their website: http://www.sanbi.org/human-capital-development).

Case study 5: CapeNature – biodiversity conservation: Western Cape

This provincial conservation body is concerned with promoting and ensuring biodiversity conservation within the Western Cape. The section relevant to marine and coastal conservation is run as a programme and is headed up by a single manager whose title is Programme Manager: MPAs, Islands and Estuaries. This programme is responsible for the research into and management of five MPAs in the region and this is on behalf of the Department of Environmental Affairs: Oceans and Coasts.

The overall mission of CapeNature is to "manage, conserve and promote our human, natural and heritage assets through best practice, access, benefit sharing and sustainable use" (CapeNature: http://www.capenature.co.za/about-us/vision-mission-values-mandate/ 2016). The organisation is mandated to promote and ensure nature conservation; render services and provide facilities for research and training; and generate income, by the Western Cape Conservation Board Act of 1998.

Case study 6: WWF – World Wide Fund for Nature Marine programme: South Africa

In South Africa, the marine programme of WWF works to ensure that MPAs and marine environments are adequately protected, by engaging with government, business and civil society. The aim is to develop an integrated approach towards how we manage and protect our oceans and the programme highlights the importance of ocean stewardship and sustainable fisheries. Their vision is to create healthy and resilient oceans which can support abundant biodiversity, sustainable livelihoods and thriving economies, but they acknowledge the challenges of overfishing due to an increasing human population, climate change, encroaching coastal development and pollution.

Case study 7: SANParks – South African National Parks: biodiversity conservation

SANParks is the largest national conservation agency and manages a system of parks which represent the indigenous fauna, flora, landscapes and associated cultural heritage of South Africa. Overall, the mission of SANParks is: to develop, expand, manage and promote a system of sustainable parks that represents biodiversity and heritage assets, through innovation and best practice for the just and equitable benefit of current and future generations. This multi-faceted organisation has a department dedicated to formal learning (Scientific Services), which falls under the Conservation Services Division. A second

division, namely the Park Planning division plays a critical role in the development and expansion of park areas, including MPAs. This division is responsible for collating scientific information and drafting management plans for the areas in question and this is done by a national Marine Coordinator.

Case study 8: Ezemvelo KZN Wildlife – biodiversity conservation: KwaZulu-Natal

Ezemvelo KZN Wildlife (EKZNW) or Ezemvelo, state their mission as ensuring effective conservation and sustainable use of KwaZulu-Natal's biodiversity and they aim to do this in collaboration with stakeholders "for the benefit of present and future generations" (EKZNW: http://www.kznwildlife.com/ezemvelo/vision.html 2017). As the provincial conservation body they are entrusted with the long-term conservation of the region's rich biodiversity, including the marine and coastal resources. Their Scientific Services division, specifically the marine specialists in the sub-division, Ecological Advice or EcoAdvice, work with the provincial Department of Agriculture and Environmental Affairs to achieve successful management and sustainability of KZN's marine resources. The scientists that work in this division ensure that conservation management decisions are underpinned by sound ecological principles and the best available scientifically-based information. Ezemvelo manage a number of marine reserves and marine protected areas, including those that form part of the iSimangaliso Wetland Park which is a World Heritage site and is recognised as a wetland of international importance under the Ramsar Convention.

Case study 9: WESSA – Wildlife and Environment Society of South Africa

WESSA is an environmental organisation that aims to initiate and support high impact environmental and conservation projects. The slogan of the organisation is 'people caring for the earth' and they are responsible for implementing a number of environmental initiatives across South Africa. One such initiative is the Blue Flag Programme which is an international eco-label originally only given to beaches but it has now been extended to boats and marinas. The Blue Flag symbol denotes a certain level of quality where the beaches, boats and marinas awarded this label meet high standards of excellence in a number of criteria. The programme focuses on the conservation of marine and coastal habitats and is "designed to provide environmental education, raise awareness and promote sound environmental practices among tourists, local populations and beach managers" (WESSA: http://wessa.org.za 2017).

A more recent initiative relating to the marine sector is WESSA's Blue Flag *Project*, otherwise known as 'Tourism Blue Flag'. This three-year coastal tourism and youth development project was implemented in partnership with the national Department of Tourism and aims to "improve the experience of local, domestic and international visitors to our beaches, while simultaneously providing youth with accredited training, with the ultimate goal of developing them for further employment in the coastal tourism sector" (WESSA: http://wessa.org.za 2017). The young people employed on this project are given the roles of "Beach Stewards" at Blue Flag sites around the country and are involved in different activities such as monitoring beach activities, conducting visitor surveys and other such data gathering events. Both the Blue Flag project and programme fall under the EcoTourism Unit of WESSA.

It should be noted that WESSA also provide quality environmental training, education and skills development programmes in order to address the scarcity of the necessary skills that are "required to drive the green and blue economy" as their website puts it (WESSA: http://wessa.org.za/what-we-do/environmental-work-skills 2017). They offer an extensive range of accredited and WESSA-certified courses and are registered as an accredited training provider with the ETDPSETA and LGSETA (Education, Training and Development Practices Sector Education and Training Authority and the Local Government SETA). This training is offered to private individuals, corporates and all government departments and the courses emphasise hands-on, practical skills, that explore situated knowledge in the context of environmental issues relevant to South Africa and globally. http://wessa.org.za/what-we-do/ecotourism/tourism-blue-flag/

Figure 1.4: Map showing the location of the nine case studies used in this research (DEA= Department of Environmental Affairs; SANBI = South African National Biodiversity Institute; WWF = World Wide Fund for Nature (South Africa); WESSA = Wildlife and Environment Society of South Africa)

1.7.1 SANCOR: Networking and communications in the marine sector

The South African Network for Coastal and Oceanic Research (SANCOR) deserves recognition as a key role-player in the marine sector, although it does not form a separate case study in this research. This non-statutory body is a significant communication tool used by scientists, students and marine professionals in South Africa and their mission is to "promote, facilitate and co-ordinate excellence in marine and coastal research and education for the benefit of South Africa" (SANCOR: https://sancor.nrf.ac.za/SitePages/About%20Us.aspx 2017). The network does this by generating and communicating knowledge and advice in the hope of promoting the wise and informed use and management of marine and coastal resources and environments. One platform they use is the SANCOR mailing list to share events, seminars, vacancies at national and international organisations/universities, conference calls, or meetings and news related to the marine and coastal environment, to name a few. They also send out a newsletter that

contains further opportunities as well as articles on the research that students and scientists are conducting around the country's coastline or in the adjacent oceans. SANCOR is a good example of a networking platform that bridges the gap between science, management, and the wider community as it is not purely for academics but rather takes an approach that ensures the articles and content is accessible to those outside academia and research. It has been useful for this research in providing ideas of what up-skilling opportunities and practices exist and I have made valuable contacts through the mailing list and related events that take place.

1.8 Thesis outline: Structure of this dissertation

This outline of the chapters helps to orientate the research and contributes towards a broader understanding of what the study involves and what can be expected in the chapters of this dissertation. After careful consideration, the structure and content of each chapter was decided on, as follows:

- Chapter One: introduces the topic of the thesis, explains the research problem and provides background and context of the research. It also outlines the research goals and questions and introduces the case studies.
- Chapter Two: clarifies the conceptual framework and discusses workplace learning in more detail. The concepts surrounding up-skilling as well as what constitutes an up-skilling opportunity or practice, are explored further.
- Chapter Three: presents the theoretical framework and explains the coherence and appropriateness of critical realism as an under-labourer/meta-theory; with its transformational model of social action (the TMSA) and Social Cube which is a critical realist theory of structure and agency that gives attention to emergence in open systems; practice theory as a substantive theory and the over-arching socio-material ontology.
- Chapter Four: explains the rationale behind the research design and lays out the methodology used to conduct the case studies, including ethical and validity considerations.
- Chapter Five: deals with the first sub-question and looks at what up-skilling opportunities and professional practices actually exist, providing an overview of the main types of up-skilling opportunities and practices in marine research and conservation organisations.

- Chapter Six: considers the second sub-question by exploring the learning and agency associated with formal and informal up-skilling, and the socio-material dynamics observed in the up-skilling opportunities and practices.
- Chapter Seven: brings together how the generative mechanisms shape the constitution and enactment of up-skilling opportunities and practices, while summarising the previous two chapters. It then goes on to show how using retroductive analysis, the events, experiences and socio-material dynamics previously described can relate to Bhaskar's (1993, 2010) concepts of emergence and causality. Finally, this chapter provides recommendations and insights into how this research has contributed to the field.

1.9 Conclusion

The purpose of this chapter was to give background and context to the research topic, as well as to present the research questions and goals, which are of critical importance to any study in education or social science. The research questions give direction to the study and lay a solid foundation on which the rest of the thesis can develop. By introducing the case studies in Chapter One, I have also been able to give some idea of what is to be expected in Chapters Four to Seven. In addition, the national and global contexts for this research into the up-skilling opportunities in the marine sector situate the study and are essential for gaining a broader perspective of the field and what has motivated this research.

CHAPTER TWO – Conceptual Framework

2.1 Introduction

In Chapter Two a number of concepts will be elaborated on and I will start by considering the concept of skill, what it means and what it does *not* mean, in this research. Specifically, I discuss what is meant when talking of up-skilling and what it is 'to up-skill', including what constitutes an up-skilling opportunity or practice. It is crucial to develop an understanding of how this term is being used in the context of this research and by clarifying the notion of up-skilling, the study will take shape and find direction going forward into the following chapters. Another important concept to consider is that of workplace learning and there has been a great deal of research carried out over the years, in this field. In this chapter, I will highlight the relevant aspects of workplace learning and how knowledge, learning and practice relate, but also how through time, they have been viewed (and used) in different ways. I will go on to explore and compare the terms lifelong learning and adult education, and discuss the associated connotations of these terms. By examining how these concepts have been used by other researchers, globally and in South Africa, and through considering the stance that has been taken with regard to education, in general, one can situate the current research and shed light on where up-skilling fits into this broader field.

Furthermore, it is essential to go into detail about the role that agency plays in workplace learning and this key concept, along with that of how an individual engages in the workplace, is discussed in the second half of the chapter. Related concepts here also include: formal and informal learning, identity formation in the workplace and factors outside the workplace that influence an individual. The purpose of this chapter is to outline and explain which concepts are relevant to this research, while in Chapter Three, the theoretical framework lays down the philosophical ideas and theories that form the foundation of the study. Blumer (1954) referred to 'sensitising concepts' and explained that "definitive concepts provide prescriptions of what to see, sensitising concepts merely suggest directions along which to look" (p.7). So from this description, we could view the concepts laid out in the theoretical framework as the definitive concepts, that are not separate from, but work together with the sensitising concepts which orientate the research and allow for a "general sense of reference and guidance" (Blumer 1954, p.7). By knowing *what* to look for and in *which* direction, the social science researcher can produce a well thought-out study and in Chapters Two and Three, I aim to demonstrate that this research into up-skilling opportunities and practices has indeed been carefully

thought out and a solid foundation has been put in place for the interpretation of findings and possible conclusions that can be drawn from this study.

2.2 What is 'skill' and what does it mean to 'up-skill'?

The concept of skill is pivotal to this research and it is crucial to develop an understanding of what is meant by skill in a particular context due to the many meanings and numerous synonyms that have arisen in the social science field (Green 2011). Some of these synonyms include "ability", "aptitude", "competence" and "talent", but there is very little consensus, especially among social scientists, about the meaning of the concept of skill (ibid.). For this research into up-skilling I find Gamble's (2004) point appropriate: that the concepts of 'craft' or 'being skilled' were once seen as integrated, holistic practices, where no distinction was made between knowledge (knowing) and skill (doing). This notion of a more holistic approach to the concept of skill is apt for the current research into up-skilling opportunities and I would argue that workplace learning and professional practices fall under this more encompassing approach. Green (2011) remarks on how from a neoclassical economics point of view, 'skill' was seen as one of the two ingredients of 'human capital' (the other being health), and education and training are considered investments in the accumulation of skill or human capital (Green 2011). Thus, in its original form, human capital development aimed to directly contribute to an economy and could be measured by its monetary value. This is *not* the way in which this research views the concept, as I am not approaching the study from an economics background. The Biodiversity Human Capital Development Strategy, on which this research is largely based, also outlines that the economical factor is not applicable to the strategy or relevant initiatives (SANBI/Lewis Foundation 2010). The focus of the document is on increasing skills of individuals so they are enabled "to better meet biodiversity goals" (SANBI/Lewis Foundation 2010, p.8), not only through additional qualifications but also in terms of competencies. It is also recognised that there needs to be enabling conditions within organisations, and these conditions, along with the skills of the individuals will determine whether they can achieve the biodiversity objectives (ibid.). These factors affect appointments of individuals, how employees are deployed into particular functions, effective execution of those functions, and whether they are retained long term by the organisation (ibid.).

It should be noted that skills policies never exist on their own and will closely interact with other policies (McGrath 2004) and in this case, the other policies would include those mentioned in Chapter One, such as the National Skills Development Strategy. Ramsarup (2017) suggested this idea could be extended by considering skills policies as connected to broader social and environmental policies which also have significant implications for skill and human capital development. In the context of this study, one of the relevant environmental policies in South Africa's marine sector is the Integrated Coastal Management Act (Act 24 of 2008) (RSA 2008), which was also introduced in Chapter One. Although this Act does not mention skills for the sector, as such, it does talk about coastal managers having "sufficient expertise and capacity to manage the special management area" (RSA 2008, p.43). Thus, the Human Capital Development Strategy for the Biodiversity sector, along with the Environmental Sector Skill Plan, is vital for the elaboration of what skills and training exist or are required, in the different branches of the biodiversity sector and it is studies such as this one that interpret these skills policies for specific sub-sectors, such as the marine and coastal sector.

Returning to the term 'up-skilling', the motivation behind using this term, for this research, comes from the same document mentioned above, the Biodiversity Human Capital Development Strategy. The strategy uses the word in various ways such as talking of "workplace-based up-skilling programmes" and "up-skilling and mentoring programmes" (SANBI/Lewis Foundation 2010, p.64 & p.v). There is also mention of organisations needing to invest in up-skilling existing staff (as new positions may not always be readily available) and up-skilling in relation to extending existing capacity. This discourse around up-skilling played a major role in guiding me during the contextual profiling phase of the research, developing the research questions for this study, as well as informing my data collection and analysis methods. The following section explores 'up-skilling' in more detail but going forward, it is also necessary to take note of the relationship between up-skilling and workplace learning, in which there has been a growing interest in the last two decades among social science researchers. This connection between skills and workplace learning (including professional practices) is an important one when considering the up-skilling opportunities and practices in the marine sector and will be reiterated throughout the research.

2.2.1 To 'up-skill' and what constitutes an up-skilling opportunity or practice

If one looks up the dictionary definition of the word "up-skill" it will tell you that the verb means: "to improve the aptitude for work of (a person) by additional training" (Upskill, n.d.). An alternate definition is offered by the Oxford Dictionary (2014) which states that up-skilling is "the learning of additional skills". This definition brings in the concept of learning and I argue this includes the formal as well as informal learning that takes place in the workplace. Thus, I work with the term 'up-skilling' as a concept that encompasses: skills development, professional practices, human capacity development, professional development and workplace learning. A great deal of research has been carried out on each of these concepts and an in-depth review of all of them is not possible in the space of one chapter. Nevertheless, certain aspects of the concepts mentioned above are applicable for this research and thus I expand on the appropriate traits of each, in the sections below and in Chapters Three and Four. Through this process, the hope is that the reader will have a clear and defined idea of what is meant by up-skilling and when it comes to discussing the findings in the final three chapters of this dissertation, the term can be used with a certain amount of confidence and surety that it is well understood.

Keeping in mind how I am working with the term 'up-skilling', we can move on to what an up-skilling opportunity or practice might look like. Knowing what to look for, or enquire about, was deliberated over at length during the research design phase of this study and it soon became apparent that in some instances an up-skilling opportunity or practice might be easily identified, such accredited certificates, degrees or short courses. However, there may also be practices that take place in and around the workplace that are not as recognisable as the straightforward, more formal, up-skilling opportunities and practices. Billet (2000) suggested these less obvious opportunities and practices include: engaging in authentic workplace activities, guidance through everyday participation in the workplace and observing other workers**.** These informal learning activities are often extremely meaningful and are explored further here, due to them being considered as up-skilling opportunities that may, or may not, be available to marine professionals.

Authentic workplace activities can be seen as actions in the workplace that are goal-directed and focused on problem solving and these activities manifest as learning experiences (Billet 2006). Support and guidance in coming to know about these activities in the workplace are equally important factors that will contribute to workers' learning of vocational knowledge

(Billet 2000). The kind of activities that take place will influence what learning occurs and how it is reinforced through subsequent experiences (ibid.) but Cole (1998) pointed out that moment-by-moment interactions are in essence, what make up experiences. Billet (2000) re-interpreted this and referred to the moment-by-moment learning that arises from work activities. He also discussed how when engaging in work activities, the knowledge about work that already exists, is transformed and refined. This process of learning is very often shaped by other workers and Billet (1995) also referred to "a more expert other" (p.22) that may offer the support and guidance that was previously mentioned. If not through direct guidance, there is also the possibility of simply listening to, and observing other workers, in the workplace and this assists the learner with the conceptualisation and approximations of the workplace tasks (Billet 1994). This notion can be expanded to include the research fields of coaching, mentoring or apprenticeships which are touched on below. However, it must also be noted that workplaces are like any other setting, in that they are inherently value-laden and this may limit the learning that takes place (Billet 1996). If one considers the learning and activities that Billet refers to below as being analogous to up-skilling opportunities and practices, it can be clearly seen how values can have an effect on the workplace. The role of preferences and goals should not be overlooked as is stated in the following excerpt:

> Values associated with the goals of the organisation (e.g. productivity, service) and of those individuals working the setting (e.g. personal or sectional interests) cannot be denied as they influence the nature, type and access to the activities which influence cognitive development. Consequently, the array of activities and access to these activities are constrained by personal and organisational preferences and goals.
>
> (Billet 1996, p.51)

With all this to consider, it becomes clear that the intricacies surrounding workplaces and what learning (or up-skilling) opportunities are afforded to the individuals participating in these workplaces, are complex and should be carefully examined when investigating the professional practices in this research.

The terms 'mentoring and 'apprenticeship' have also been used with regard to up-skilling and for this research, both formal and informal apprenticeships or mentoring programmes can be considered up-skilling opportunities or practices. Coaching is another term that has been adopted into working life as a staff training method, although it is often used in a broad and vague way and is related to mentoring and on-the-job instruction, in many instances (Kemmis & Heikkinen 2011). Similar concepts to coaching include supervision and job shadowing (see

Eraut 2007) but for the purposes of this research, I will consider all these concepts as falling under the umbrella term of 'mentoring'. The concept of mentoring stems from the word 'mentor' which means a 'father-figure' who guides and instructs a younger person and much has been written about mentoring and its potential for enhancing workplace learning (Ehrich et al. 2001). Indeed, in many educational environments, the discourse of mentoring has become common place and formal mentoring programmes are often seen as a way of addressing organisational complexity (Dominguez & Hager 2013). In a review and critique of mentoring and its theoretical underpinnings, Dominguez and Hager (2013) focused on mentoring in the context of higher education and highlighted the relationship between theories and mentoring programmes or practices. They also noted how in some cases mentoring can take on the appearance of the traditional master-apprentice relationship and Billet (1994) described this form of guidance as one that "involves joint problem-solving and the gradual withdrawal of the more experienced other as the learner becomes increasingly able to work without close guidance" (p.113). Jean Lave has also worked extensively with the notion of apprenticeships and in her chapter entitled 'The Culture of Acquisition and the Practice of Understanding' (1997), she talked of apprenticeships as a form of learning and how they are "likely to be based on assumptions that knowing, thinking and understanding are generated in practice" (p.19). This reference to practice links the work done by Lave and colleagues to this research into up-skilling opportunities by bringing into focus the importance of the social world and in her chapter she describes how social practice theory argues for *knowledge-in-practice* (Lave 1997).

The inclusion of knowledge and understanding in this study is crucial since the focus is on scientists and managers, but also the high level skills that are of interest in this research. If one is working with professionals and considering the potential for workplace learning, there must be a certain amount of knowledge and deeper understanding involved in their careers and where and how this is accumulated should be examined in conjunction with the day-to-day skills that are required by these professionals. Lave (1997) posited that knowledge-in-practice is "constituted in the settings of practice, based on rich expectations generated over time about its shape" and is "the site of the most powerful knowledgeability of people in the lived-in world" (p.32). She continued by describing a theory of understanding-in-practice and how learning (and its applications) cannot be separated from the social world and everyday practices (Lave 1997). In this space of the social and in the 'settings of practice', there may also be more natural processes that result in informal mentoring relationships (Ragins &

Scandura 1999). These informal forms of mentoring are often more worthwhile than a formal arrangement and the capacity building potential is greater due to the relationship developing through the selection of the mentor based on valued characteristics (Dominguez & Hager 2013). It should be noted at this point, that the relevance of mentoring or apprenticeships should be seen in the light of the fact that I am working with professionals or senior scientists/managers who are generally more advanced in their careers. So although mentoring may be significant when they reflect on their past experiences, it is a possibility that many of them could be in the 'mentor' position at this stage of their working lives and are playing an important part in the skills and knowledge development of more junior colleagues.

Returning to the subject of formal training opportunities, an example of an opportunity that included apprenticeships as part of the capacity building programme can be found in the project that aimed to form a network of marine protected areas in the Red Sea and Gulf of Aden region (Gladstone et al. 2003). The training, in this case, involved under-skilled MPA planners and managers who were offered further training in the fields of: management plan development; sustainable financing; GIS (geographic information systems), using web pages as a support tool for management and community awareness; and the processes of public consultation and participation (ibid.). The MPA planners and managers also undertook supervised apprenticeships as a means of exposing them to alternate approaches to management and technological developments (ibid.). A similar example is that of the WIO-COMPAS programme that was discussed in Chapter One, where the aim to formally recognise the skills and knowledge of the MPA professionals involved, was a driving force behind the development of a certification process (Squillante et al. 2010). In the process of making the programme operational, the designers/researchers hired and trained a team of experts to serve as assessors whose responsibilities included providing professional development mentoring to the candidates involved in the programme (ibid.). Formal arrangements such as this certainly have their place when reviewing the up-skilling opportunities available in the marine sector and it is important to identify such cases.

Another avenue to explore when identifying an up-skilling opportunity or practice is to look at the formal documentation that relates to human resources in an organisation or institute. These documents can go by different names, such as skills (or professional) development plans, human capacity development strategies, workplace skills plans, or variations of the aforementioned. Skills development plans that are put in place by the organisation, or a

Human Resource department within the organisation, offer insights into the opportunities that should be, or are, available. Document analysis was therefore an important part of the data collection process (see Chapter Four) and although not always specifically to do with the marine professionals in an organisation, these documents made valuable contributions to the findings of this research.

It is clear that the nature and availability of up-skilling opportunities and practices in an organisation are influenced by a number of factors and the skills required are diverse. One such factor to take into account is the socio-ecological environment (SANBI/Lewis Foundation 2010) and this calls for a well-rounded understanding of the ecological as well as the social dynamics that are present in the area of interest. For example, in South Africa, the conservation concerns, or marine ecosystems on the KwaZulu-Natal coastline may be very different to those in the Western Cape or even certain areas of the nearby Eastern Cape. On top of this, the provincial government departments may have differing approaches when it comes to managing and conserving the MPAs in the province or the marine and coastal organisations might be structured differently in terms of staff and mandates. When investigating the up-skilling opportunities and practices in these organisations, it is necessary to keep it mind all these interacting factors that can influence the skills and knowledge required by the marine professionals. Even elements that appear to be outside the realm of managers and scientists such as the local communities surrounding an MPA, or changes in the government policies are considerations. Thus a marine professional needs a firm grasp on so much more than simply the marine and conservation science that defines them as 'marine' professionals. These more complex aspects of this research are discussed in Chapters Five, Six and Seven of this dissertation, where the findings are presented and explored at length.

2.3 The shifting nature of work, knowledge, learning and practice

The concept of up-skilling reflects a substantial shift in the nature of work and learning in developed and developing countries. Within South Africa and globally, modern work environments are changing rapidly and the issue of skill and knowledge transformation requires ongoing research and realistic solutions. Expanding on the relationship between skills and knowledge that was mentioned in the previous section (the work by Lave 1997) we can consider how skills and knowledge are often located in organisational systems of social and/or economic relations (Fenwick 2006). It is also important to understand how skills operate and

change in these contexts (ibid.) and what new knowledge might emerge when the contexts are different. Fenwick (2006) pointed out that knowledge is generated in varying ways in an organisation as well as by individuals, while Kemmis (2005) explained that both knowledge and skills inform practice and are often shaped and formed in, or through, the circumstances of an individual's life and in the opportunities they have encountered. Furthermore, in her research on professional practice, Silvia Gherardi (2012) described how, when researching learning and practice, one can use situated, socio-material activity as a unit of analysis. These ideas are expanded on in Chapter Three when reviewing practice theory and its origins, as well as the use of a socio-material approach to this research on up-skilling.

Authors such as Gherardi, as well as Theodore Schatzki, have acknowledged a 'practice-based turn' in organisational studies (Fenwick 2010a) and much attention has been given to the fundamental link between activity and practice by Schatzki (2007). Gherardi (2012) explored the concept of knowing-in-practice and its usefulness for interpreting knowledge as "a situated, socio-material activity and as a collective practical accomplishment" (p.16). The significance of the practice turn can be seen in this research when one considers the *activities and practices* of professionals in the marine sector of South Africa and how they learn, or arrive at knowledge, through up-skilling opportunities and practices. Globally, this interest in practice, knowledge and learning in the workplace has also given rise to the notion of a learning economy (Biesta 2006) and with people changing jobs more frequently, there needs to be a "more frequent renewal of knowledge and skills" (OECD 1997, p.13). Fenwick (2006) described this as an issue of skills transformation and suggested that in rapidly changing work environments (such as those in the biodiversity sector of South Africa), the entire system needs to be examined, from organisational structures and cultures to the sharing of knowledge. This learning economy can also be referred to as the 'knowledge economy' and in the third National Skills Development Strategy, it is recognised that South Africa lacks the intermediate and higher skills that are required for this 'knowledge economy' (DHET 2011). This issue of intermediate to high skills is elaborated on in the following section, but from the above discussion, it is justifiable to deliberate over what learning is most valued and, as is done as part of this study, to consider what up-skilling opportunities and practices are available or are taken up by marine professionals in South Africa.

Another observed shift in educational discourse and practice is the use of the term 'lifelong learning' over the term 'adult education' (Hager 2004, Biesta & Leary 2012). Lifelong

learning has become increasingly popular over the past decade and Biesta (2004) clarified how there has been a wider shift to a 'language of learning'. Despite there being many advantages to this new discourse, there are also limitations such as the individualistic nature of the term and the lack of attention paid to the importance of relationships in educational processes and practices (Biesta 2004, Biesta & Leary 2012). These relationships and interactions can often result in informal and non-formal learning which have been recognised as valuable and often overlooked forms of learning in organisations and workplaces (Lave & Wenger 1991). The concept of informal learning tends more towards the discourse of adult education by highlighting the social significance of learning from other people, while still allowing for individual agency (Eraut 2004). On the other hand, Hager (2004) stated that "informal learning is a key part of lifelong learning" (p.12) and that learning should be seen as an ongoing process rather than a product, although Hager also acknowledges that lifelong learning can be viewed as "unattractive" (2004, p.9) when researching learning in work situations. These ideas are summed up by Biesta (2006) who argued that lifelong learning is an elusive concept that means many different things to many people, sometimes meaning more than one thing at the same time. In their paper on lifelong learning and emancipation, Biesta and Leary (2012) suggested an emancipatory approach to lifelong learning and that this is needed due to the limitations mentioned above. They described how the phrase is so "smooth" that "it could well have been invented by an advertising agency" (Biesta & Leary 2012, p.6) and went on to suggest how there is a certain naturalness about the phrase that makes it easy to present the idea as something inherently good and desirable. Yet, the word 'learning' in the English language is in fact neutral (one could 'learn' bad or undesirable habits too) and has a certain emptiness to it until the content of the learning is specified, and importantly, the purpose of the learning (Biesta & Leary 2012). The language of learning has therefore been somewhat problematic in educational settings as the point of education at all levels is that the students learn something for particular reasons (ibid.). Nevertheless, Biesta and Leary (2012) believed that lifelong learning can still live up to its emancipatory potential if the terms of the conversation are rethought and if critical questions are asked about the very idea of learning.

Taking this into account, in this research into up-skilling, I take the route of not completely abandoning the discourse of learning since the focus of this study is workplace learning and in the main research question I even ask: how up-skilling opportunities enable learning? However, to avoid the individualistic nature of the term 'lifelong learning', I use the phrase

‘adult education’ mostly, while still keeping in mind that I am looking at individuals and how they make use of up-skilling opportunities or take part in up-skilling practices that contribute to their understandings (and learning) when in the marine and coastal workplaces they are a part of. The following sub-section discusses the relevant skills policies and approaches to skills development in South Africa and as Biesta and Leary (2012) pointed out, we must be aware of how current lifelong learning policy is strongly biased towards the economic function of lifelong learning and it is often seen as the production of human capital.

I propose that this is also true for South African policies but a more critical stance is taken to lifelong learning, while adult education is still referred to in much of the literature and research into learning and work. For example, the Human Sciences Research Council (HSRC) of South Africa produced a book in 2009 with the apt title of ‘Learning/Work: Turning Work and Lifelong Learning Inside Out’ (Cooper & Walters 2009), in which scholars from all over the world argue for a better understanding of the underlying social relations and practices that shape learning/work possibilities and in this way they challenge the established norms of lifelong learning.

Having established that the focus is on adult education and the learning that leads to up-skilling in this research, it is also necessary to have a clear definition of education and for this I turn to the work by Kemmis et al. (2014) and their view on education. Kemmis and co-authors offer the following definition:

> Education, properly speaking, is the process by which children, young people and adults are initiated into forms of understanding, modes of action, and ways of relating to one another and the world, that foster (respectively) individual and collective self-expression, individual and collective self-development and individual and collective self-determination, and that are, in these senses, oriented towards the good for each person and the good for humankind. (p.26)

The view taken on education here is based on the idea that schooling is not the same thing as education and that education needs to be recognised as a discipline, a field and a possible profession (ibid.). This is relevant to this research as I investigate the practices within the social spaces of the marine organisations and how the marine professionals function in and around their workplaces and with others. Figure 2.1 is a schematic representation of the above definition and is taken from the Kemmis et al. (2014) paper which also explores the purpose of education. They summarised the purpose of education as: “to prepare people to live well in a world worth living in” (p.27) and this can be seen in the diagram. The layout of the figure

follows that of the practice architectures of practice theory, and this will be explored further in Chapter Three. At this stage, it can be acknowledged that the configuration serves as a clear means of conveying the ideas and definition of education proposed by Kemmis and co-authors.

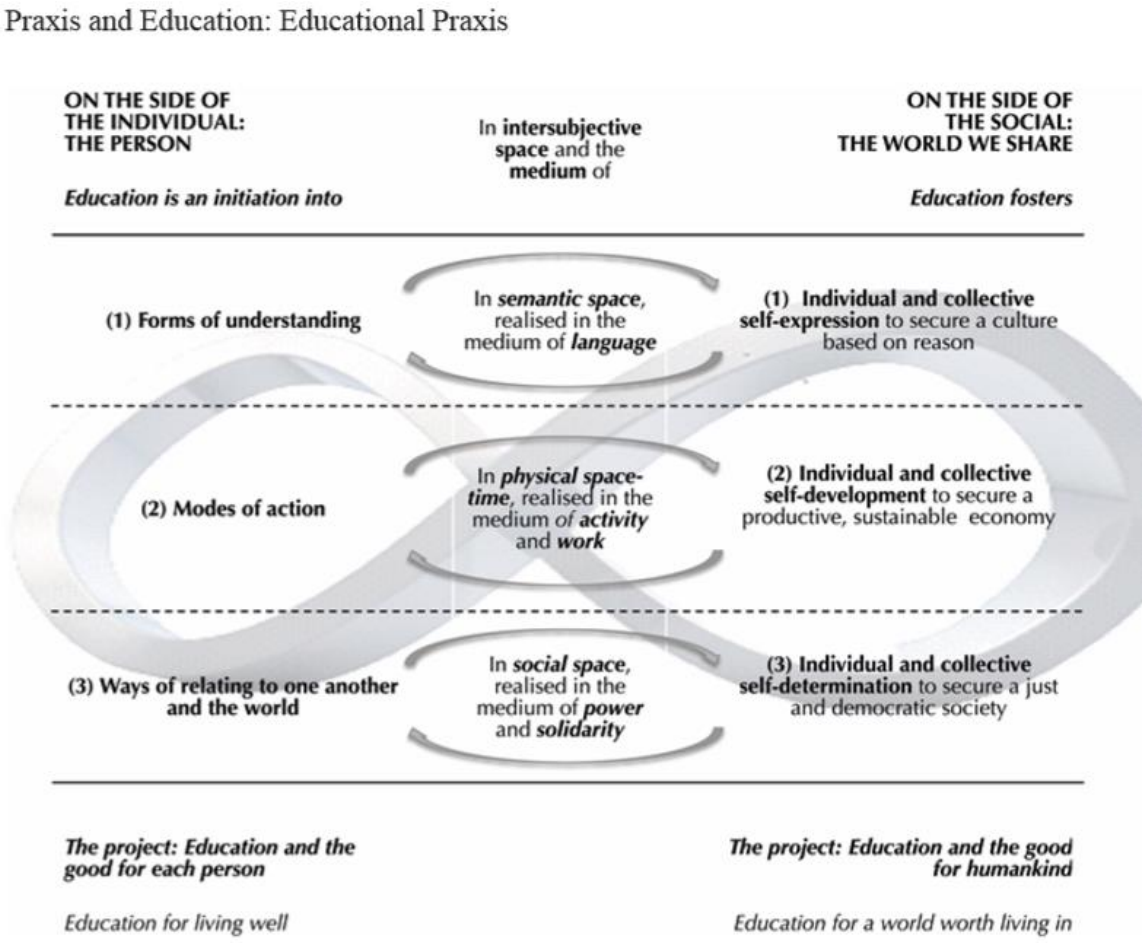


Figure 2.1: A theory of education as presented by Kemmis et al. (2014, p.27) showing how Educational Praxis can be defined in terms of practice theory and the arrangements that apply to both the individual and the broader social world. (For more on the intersubjective spaces that form the middle column of the diagram, see Chapter Three: Section 3.3.1.)

2.3.1 Skills and lifelong learning in South Africa: From practice to policy

South Africa has strong history of continuing education, non-formal adult education (or 'lifelong learning') and short courses, which have generally been provided by public higher education institutions (Walters & Daniels 2009). When considering formal learning, it must be noted that there is frequently an emphasis on accredited certificates, degrees or short courses by employers in South Africa, but the DEA (2010) points out that short courses, in

particular, are usually ‘provider-driven’ rather than needs-driven. Additionally, mentors, internships, communities, everyday practices and even family relationships can provide the type of knowledge, skills and competences that are required by the environmental sector (DEA 2010). In 2004 a book entitled ‘The Shifting Understandings of Skills in South Africa: Overcoming the Historical Imprint of a Low Regime’ was published and it set out to examine the multiple and shifting meanings that skill had, in South Africa. McGrath (2004) pointed out in the introduction that the primary objective was to look into how skill is being played out in contemporary policies and practices within the country. The eleven chapters of the book consider multiple and varying factors influencing skills development at different levels and in different policies, but of particular interest for this research into up-skilling of professionals, is the debate around ‘high-skills’ and how taking this route could lead to reforming vocational education and improving economic performance; a debate which captured the imagination of South African policy makers (Ashton 2004; Kraak 2004a) when developing the *Skills Development Strategy* of the Department of Labour, for example. Although the interest in high-skills is not unique to South Africa, McGrath (2004) explained how:

> South Africa’s apartheid-driven industrial development path had led to an intense polarisation of skill between high skill and low skill elements; with a serious underdevelopment of the intermediate skill segment which is seen as essential to successful industrialisation and competitiveness internationally. (p.17)

In addition to this problem of polarisation of high and low skills, in 1994 the incoming state had to deal with the challenge of a seriously dysfunctional skills development system, that was also extremely racialised and gendered, where black (particularly female) South Africans had been denied access to skills development or had no formal recognition for their actual levels of skills and knowledge learned on the job (McGrath 2004).

The way in which skills and knowledge are defined nationally, greatly affects how one would investigate the up-skilling opportunities and practices of professionals in any sector. A narrow understanding of skills development, such as where training is focused on occupational tasks or where it is separated from the powers at play (Allais 2011), can lead to many problems arising in workplaces and organisations, resulting in both employers and employees becoming dissatisfied and despondent in their jobs. This would have major negative implications for the sector in question and it is for this reason research into skills development is so important. The biodiversity sector of South Africa (and in particular the

marine sector where I am focusing my research) has many challenges when it comes to skills and knowledge and many of these are exacerbated by South Africa's complicated historical background.

In organisations, leaders often regard knowledge gaps between what existing workers can do, or what they know, and the skills transformations that are required for them to perform their roles more efficiently. Even in policy the discourse of knowledge gaps or skills shortage prevails, particularly in South Africa (McGrath 2004). Conventionally, the response to such gaps would be training to fill the gap but this is largely taken from an individualist acquisitive view of learning where the focus is on the worker (Fenwick 2006). As Fenwick (2006) argued, the problem is much more complex than simply up-skilling in this manner; knowledge or skill "has as much to do with what is actually recognized and mobilized as it does with workers' performed and observed capability" (p.298). So, up-skilling in the educational context, and in the way it is used in this research, is more than simply "filling a gap" or offering or attending additional training. Some questions that Fenwick (2006) put forward with regard to the above quote, are especially relevant to South Africa, such as how and why skills demands appear to be shifting in changing work environments; how knowledge is in fact generated and recognised by individuals and groups in different positions in the workplace; and how skills are mobilised or enabled in different activities and practices. In previous work, Fenwick (2001) referred to flexible workers who are responsive, adaptive and transferable and these are important traits when investigating how individuals reflect on the up-skilling opportunities available to them.

2.4 Agency and an individual's engagement in the workplace

Agency, as defined by Archer (1995), refers to the reflexive, creative, innovative, and purposeful actions of people and the choices that people make in their daily lives which either reinforce existing structures and cultures or transform them. This follows on from work done by Giddens (1979) who reconceptualised self-determination as an aspect of human action and called this agency. He considered the notion of agency, in relation to social structure, as highly relevant when an individual is participating in a practice (Giddens 1984) and he believed that it "is a necessary feature of action that, at any point in time, the agent 'could have acted otherwise'…" (Giddens 1979, p.56). Similarly to Archer, Giddens explained how this action could have positive or negative effects on the world. Even then, Giddens (1979)

acknowledged that this "sense of 'could have done otherwise' is obviously a difficult and complex one" (p.56). Bhaskar offered one possible solution to the complexity of what agency is and how it is enabled; he considered it to be enabled at four levels which he calls the four-planar being (Bhaskar 1993, Bhaskar & Scott 2015, Bhaskar 2012). This concept, along with how it forms part of Bhaskar's Transformational Model of Social Activity (TMSA) will be elaborated on in Chapter Three, but the four levels (or 'planes') are concerned with the agent's subjectivity, our relationships with ourselves and with others, and the social structures that the agent engages with. Importantly, the four-planar social being also considers our relationship with the earth or nature (i.e. materiality) and in Chapter Three, the 'social cube' will be introduced to better depict Bhaskar's four-planar being and his transformational model of social action, which has also informed Archer's theory of agency.

This relationship between agency and materiality has been expanded on by Barad (2003, 2007) who worked with ideas of relational agency from the perspective of feminist theory and quantum physics. By taking agency as relational, possible only through assemblages, Barad referred to 'intra-activity' where entities become linked via a mutual constitution that occurs simultaneously with their joint actions. She proposed a sophisticated conception of complex materiality that she termed 'agential realism' (Barad 2003). In Section 3.4 of Chapter Three, more is said about Barad's understanding of materiality as well as non-human and human agency but it can be noted here that Barad saw the world as "an ongoing, open process of mattering through which 'mattering' itself acquires meaning and form in the realization of different agential possibilities" (Barad 2003, p.817).

The descriptions of agency given here, serve to clarify how I will be working with it in this research and by including the choices an individual makes with regard to their daily lives and, in this case, their up-skilling opportunities and practices, I hope to provide an in-depth understanding of the learning that occurs in the relevant workplaces. Furthermore, the relationship between agency and the learning process is of interest and Bhaskar argued that transformation needs to happen at all four levels of the social being (Bhaskar & Scott 2015). In this way, the role of agency in the up-skilling opportunities and practices of the marine professionals is linked to transformation in that the learning that takes place can be seen as transformative praxis.

In the last decade, agency has increasingly been associated with educational and learning sciences as well as workplace and lifelong learning (see Eteläpelto et al. 2013). This is due to the predominant theories of learning taking an interest in how knowledge is constructed and how the learner plays an active and agentic role in this process (ibid.). The emphasis on human agency in adult learning has developed alongside the idea of learning being seen as something that not only takes place in educational institutions but also through work (Billet 2006, Biesta & Tedder 2007, Paloniemi & Collin 2009). This is reiterated at the end of this section when considering an individual's engagement in the workplace, as well as their personal agency, but for now I explore the ideas surrounding professional agency. In this regard, one can consider Giddens' definition of agency that was touched on previously and how he highlighted the power of individuals and their actions being a necessary condition to bring about something (Eteläpelto et al. 2013). The notion of power, according to Eteläpelto and co-authors, is "thus seen as inseparable from the subject's practice of agency, and the lack of power to engage in an action, implies a lack of any practice of agency" (Eteläpelto et al. 2013, p.50). They went on to say that when addressing professional agency in the context of working life research, "power in its different manifestations should be regarded as closely bound up with agency" (ibid.) and that the role of power has not been greatly discussed in education and learning research. Contrary to this latter statement, the topic of power is included in much of the research by Kemmis and colleagues when considering professional practices and practice architectures in learning and educational environments. In their research, there is a focus on 'power and solidarity' in the relationships and social spaces of the practices that are being investigated (Kemmis et al. 2009, Hemmings et al. 2013, Kemmis et al. 2014). This social space can also be considered a person's *relatings* and makes up one of the three intersubjective spaces that are suggested by Kemmis and Grootenboer (2008) as making up practices (see Chapter Three for more details on practices architectures and these intersubjective spaces). It can therefore be seen that the matter of power is critical when exploring professional agency. Billet and Pavlova (2005) also discussed social agency which includes the abovementioned aspects of professional agency while also taking into account how an individual's subjectivity is influenced by social suggestion. This then relates to personal agency and an individual's sense of self which plays an important part in social and professional surroundings of the individual. In social practices and settings, such as the workplace, considering the individual's agentic role means including their interests, identities and preferences (Billet & Pavlova 2005), in addition to the goals and continuities of the social practice, as well as the possibility of the individual playing an active role in the practices'

remaking (Billet 2006). Vähäsantanen and Eteläpelto (2011) viewed agency in the workplace as being needed not only for reshaping and renegotiating work identities but also for the subject's sense of a professional self which will influence how he/she practises agency at work. Thus it can be seen how individual agency is connected to and intertwined with the notion of identity formation and professional identities and practices (Billet & Pavlova 2005).

Agency in and around the workplace, and for this research in particular, can also be expanded to include the work done on socio-materialism, by acknowledging the possibility of 'material-discursive agency' (Barad 2003). When examining professional practices, Fenwick (2012) suggested the following:

> Perhaps a key contribution of sociomaterial analysis to research on work and learning is to de-couple knowing and action from a strictly human-centered socio-cultural ontology, and to liberate agency from its conceptual confines as a human-generated force. Instead, agency as well as knowledge is understood as enacted in the emergence and interactions – as well as the exclusionings – occurring in the smallest encounters. (p.6)

This 'liberation' of agency involves boundaries and properties of elements coming into being and subjects and objects producing force (Fenwick 2012) so that any future encounters such as those mentioned in the extract, are unpredictable and could have alternate outcomes (Barad 2003). Once again, more about socio-material analysis and approach is explained in Chapter Three but the relevance of material-discursive agency for up-skilling, is that certain material aspects of professional practices and individual's working lives will influence the training, learning and skills development programmes in an organisation or sector. This is in conjunction and in addition to the structural factors at play which Archer (1995) argued are inherently linked to agency; hence, she frequently used the term 'structure and agency' as opposed to referring to 'agency' alone.

The structural factors that interact and influence an individual's agency differ from one situation to another and in the context of the marine sector, one should investigate the specific structures in place. Communication mechanisms, for example, have emerged as an important factor shaping agency of professionals in this sector (Squillante et al. 2010) as well the availability and functionality of networking structures between conservation organisations/ institutions (ibid.). The availability of professional training and certification are other structural factors to consider in up-skilling and agency development. For example, the WIO-COMPAS programme that was outlined in Chapter One and mentioned earlier in this chapter

has developed what seems to be an effective strategy for recognising competencies and skills related to Marine Protected Areas (MPAs). These structural developments related to up-skilling enable an individual and their professional agency while strengthening their motivation to engage in professional development and improved up-skilling practices. Billet (2001) considered an individual's engagement in the workplace and raised the idea of how an individual will "participate in and learn through work" (p.210). Furthermore, it is important to consider the learning or up-skilling that takes place outside of the formal work environment, but that still contributes to the individual's effectiveness in their career (i.e. *for* the workplace). For this reason, I included the phrase "*in, through and for* the workplace" in my main research question (see Chapter One, Section 1.5).

2.5 Conclusion

This chapter has explained a number of concepts which are relevant to this research and through elaborating on these ideas, I have provided further details of what this study is looking *at* or *for*. As described in the introduction, it is useful to consider these as important 'sensitising concepts' which give direction to, or orientate, the research. Many of these concepts and the associated background literature will be picked up on again in the following chapters and by keeping in mind what has been explored here, we can gain a deeper, well-rounded understanding of the up-skilling opportunities and practices that enable learning in the marine sector of South Africa.

CHAPTER THREE – Theoretical Framework

3.1 Introduction

Chapter Two outlined the concepts that give direction and focus to this research, whereas Chapter Three takes an in-depth look at the theoretical framework that holds this study together and allows for meaningful insights to be gained from the findings. Through the use of an overarching metatheory, social science researchers can organise and better analyse their data and enhance their understanding of what is important and what is not. In doing so, the researcher can also avoid falling into the trap of merely describing their data, rather than analysing it to answer the research questions in a way that makes a novel contribution to the field. This is commonly accepted as the goal of doctoral research and in the field of environmental education in particular, the emphasis on bringing about change through one's research has gained momentum. These changes may be one of, or a combination of, environmental, educational or societal change; Price (2007) and Lotz-Sisitka (2009) have called for the research in environmental education to have stronger, wider ontological reach than it has in the past. Thus, researchers in this field are turning to the theories that align with the philosophy of critical realism more and more, due to the critical realist research methods that make causal mechanism explanations possible (Lotz-Sisitka 2009).

In this research into up-skilling opportunities and practices, there are two principal theories that are used as substantive theories within (and *with*) critical realism (see Figure 3.2). These are practice theory and socio-materialism. Practice theory considers how practices can be explored through the sayings, doings and relatings that make up a particular practice and when arranged into a framework or 'practice architecture', these arrangements prefigure and shape the conduct of the practice (Kemmis & Grootenboer 2008, Kemmis et al. 2009). A socio-material approach highlights both the social and material relations that are entwined in bringing out professionals' practice (Fenwick et al. 2011). In this chapter, I explain how and why I arrived at these theories and give details of what each one means and the implications for this research into up-skilling. I also discusshow these theories work together and where their commonalities lie, as well as their differences. It was through much deliberation that these theories were chosen for this research, with the potential outcome being a deeper exploration and understanding of the up-skilling opportunities and practices in the marine sector of South Africa.

3.2 Critical Realism

It was evident from the early, conceptual stages of this research that critical realism was a useful 'underlabouring' philosophy and by this I mean it best articulates an understanding of the world that stretches beyond conventional thinking of linear causality and the empiricism of a positivist approach. Critical realism has the expressed intention of providing a realist ontological framework for complementary social theories that explore society or social phenomena. Its focus is on ontology, not epistemology (Sayer 2000). Critical realism accommodates relativist or constructed epistemology, but offers a realist ontology, unlike hermeneutics which offers a constructed ontology and constructed epistemology. Archer explained the importance of philosophical underlabouring by pointing out how it has implications for social theory as ontology "acts as both gatekeeper and bouncer for methodology" (Archer 1995, p.22) because "what society is held to be… affects how it is studied" (ibid., p.2). By using critical realism to frame this research, I could consider ontologically situated generative mechanisms that shape up-skilling opportunities and practices and explore the practices and learning that take place in an in-depth manner as well as epistemological understandings and experiences of these. These generative mechanisms are defined as the underlying structures and powers which have causal efficacy in the world (Danermark et al. 2002, Sayer 2000). An alternative explanation is that generative mechanisms are the structures with enduring properties that provide causal criteria for existence rather than simply perceptual ones (Mingers 2004). To understand the reality we experience, we must consider the argument that "there is an ontological distinction between scientific laws and patterns of events" (Bhaskar 1978, p.12) and that critical realism considers natural and social phenomena to be real, but our knowledge of these phenomena is theory-laden and fallible (Sayer 2000).

As the initiator of critical realism, Roy Bhaskar aimed to unsettle the long tradition of a positivist conception of science and ultimately uncover a number of flaws in the methods of scientific enquiry (see *The Possibility of Naturalism,* 1989 [1979]). In his book, *A Realist Theory of Science* (1975), Bhaskar distinguished between three ontological domains as presented in the table below. Hence, critical realists understand the world as differentiated and as stratified, where mechanisms belong to different layers or strata of reality (Danermark et al. 2002) and, as can be seen in the table, these strata are hierarchical.

Table 3.1: Critical Realism's domains of reality

	Domain of Real	Domain of Actual	Domain of Empirical
Mechanisms	X		
Events	X	X	
Experiences	X	X	X

The domain of the *real* includes whatever exists in the social and natural world and is independent of both mind and society. In Bhaskar's words, the real world is "relatively independent of the patterns of events and the actions of men alike" (1998, p.41) and the underlying mechanisms are considered 'generative' as they generate *events* and make them available to *experience.* These form part of the second and third strata as described below. The *real* is said to include the generative mechanisms or preconditions that are present, but also objects, language, discourses and values because they can have causal effects (Sayer 2000). The domain of the *actual* refers to events that take place and are brought about when or if the generative mechanisms are activated, while the domain of the *empirical* is what is observed or experienced by human beings. Thus, in the empirical domain, the experiences of knowing subjects can be identified, in this case; the professionals in the marine sector who shared their experiences of up-skilling and learning in the workplace. Furthermore, critical realists take knowledge and theories of the real as transitive objects of science; they can only be regarded as the best truth about reality we have, whereas reality is the intransitive object of science where mechanisms come into play (Danermark et al. 2002). This is where critical realism makes an epistemological departure from mainstream realism by taking reality as something beyond what we know and understand (Sayer 2000).

For environmental education, in particular, critical realism is valuable due to its commitment to ontology and its capacity for causal explanation that extends beyond experiences or events (Sayer 2000). By searching for causal explanations, one can gain a deeper understanding of environmental and sustainability practices and move away from viewing these practices merely as relativist 'social constructions' (Lotz-Sisitka 2009). In this research into up-skilling opportunities and professional practices, a commitment to ontology and uncovering generative/casual mechanisms allows for more thorough analysis of the practices and I hope to gain a better understanding of the realities faced by the professionals working in the marine sector of South Africa. Mingers (2004) pointed out that when working in the social world, critical realism recognises the inevitable fallibility of observation and this is why researchers need to be fully aware of the assumptions and limitations of their research. In this

study, this awareness is displayed through a thorough outlining of the context of this study in Chapter One, a clarification of the theoretical lenses in the current chapter, and discussing the limitations of the research design in Chapter Four. Through a commitment to ontology and striving to achieve depth in this research I hope to produce a clearer picture of the structures and powers involved in the up-skilling opportunities and practices of the marine sector. In this way, relevant and worthwhile recommendations or suggestions can be made to the relevant Sector Education and Training Authority (in this case, CATHSSETA) and in turn, the organisations involved in this study.

3.2.1 Emergence and Bhaskar's causality

Following the above description of a stratified ontology, critical realism maintains that the hierarchical strata are emergent; i.e. over time the powers, properties and mechanisms of one stratum emerge from those below (Archer 1995, Danermark et al. 2002). Thus, an object has 'emergent powers' and if you consider an upwards movement through the different strata, each new strata represents something entirely new, unique and qualitatively different (Danermark et al. 2002). Bhaskar (1993) pointed out how these strata of reality are related but not reducible to each other and described it as "a 'laminated' system, whose internal elements are necessarily 'bonded' in a multiplicity of structures" (p.600). Not only do new causal powers emerge, but they may also react back upon the simpler strata from which they emerged, often in complex, differing ways.

In the previous section, a brief mention was made of causal efficacy but it should be clarified that causal laws must be analysed as objects which exist and act independently of our access to them (Bhaskar 2010). It is important to identify these "previously unknown deep structures and causal mechanisms of the world" as Bhaskar argued (2010, p.2), so that researchers can avoid the epistemic fallacy of reducing reality to that which is seen, measured or known about it, and get as close as possible to knowing the intransitive dimension. Often, in case study research such as this, interpretive approaches are taken to data analysis and representation (Maxwell 2008) and although this is necessary within a critical research design, it is taken a step further by seeking out the deeper structures and generative mechanisms that Bhaskar talked of in the above quote. A critical realist approach also allows one to avoid the issue of ontological actualism (Bhaskar 1993), which involves equating

ontology to actual events that take place. For example, in social science, human conduct cannot be reduced to observable behaviour, social effects or interpretive action (Sayer 2000).

Thus, when considering up-skilling opportunities and practices, one must be aware that what is presented as the situation, or the events and actions that are described in the data, may not be the full story and it is crucial that the researcher considers the mechanisms at play that produce such actions or events. Uncovering these causal laws and emergent properties allows for thick description in case study research and the up-skilling opportunities and practices can therefore be explored in more depth and as Sayer (2000) proposed, it is then possible to generalise the lessons learnt from these cases, at the level of the generative mechanisms or tendencies. This is taken further in the following section on retroduction.

3.2.2 Retroduction

Another essential aspect of critical realism is the role of retroduction as a mode of inference when considering scientific methods as well as when developing knowledge in social science. Each mode of inference – deduction, induction, abduction and retroduction – represents a different thought operation or a different method of moving from one thing to something else (Danermark et al. 2002). While deduction, induction, and according to some, also abduction (ibid.), follow a logical form of inference, retroduction is not a formalised mode of inference, but is about "advancing from one thing (empirical observation of events) and arriving at something different (a conceptualization of transfactual conditions)" (Bhaskar 2010, p.96). These transfactual conditions are metaphysical explanations inferred from empirical evidence (Price 2012); in this research, for example, the empirical evidence is in the form of the Human Capital Development Strategies that are present at many marine and coastal organisations or the findings from the semi-structured interviews. Retroduction, therefore, allows for cautious generalisation in the social sciences and works towards overcoming the problem of moving between the individual/specific and the universal or general (Danermark et al. 2002). This makes for more meaningful research and the conclusions can have broader relevance to the biodiversity sector as well as the education and training systems in place.

In other words, a critical realist would use retroduction to take some unexplained phenomenon and propose hypothetical mechanisms that, if they exist, would generate or *cause* the phenomenon (Mingers 2004). This also has an influence on the validity of one's research and

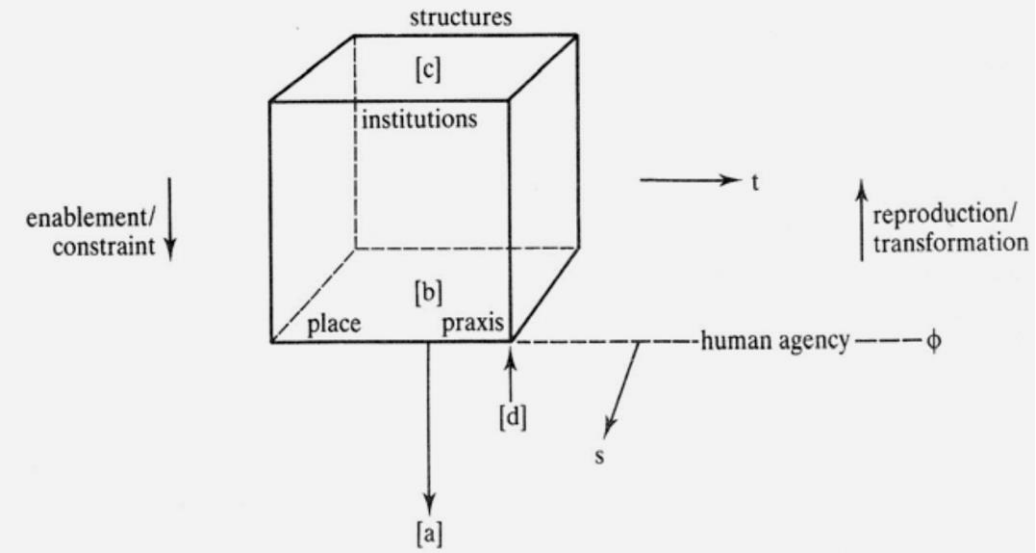
Price (2007) showed that by testing findings against other instances of similar research, critical realists can strengthen the validity of their retroductive inferences. In many ways this could also be seen as being able to move from the experiences in the empirical domain to possible structures in the domain of the real (Mingers 2004), but it must be noted that there may be competing explanations or hypotheses and one must acknowledge the relativity of knowledge by not taking the explanation as absolute proof of the phenomenon (ibid.). Using retroductive analysis to explain events by hypothesising causal mechanisms and the issues surrounding validity of the data generated is explored further in Chapter Four when discussing data analysis.

3.2.3 The Transformational Model of Social Activity and the four-planar social being

The Transformational Model of Social Activity (hereafter, the TMSA) is used to understand the interactions between social structures and human agency and in this study, that means understanding these interactions in the context of up-skilling practices and the marine sector of South Africa. The TMSA outlines the nature of social objects and argues that an agent fashions a product out of the pre-existing material and with the tools available to him/her. It was in his 1979 book, *The Possibility of Naturalism – A Philosophical Critique of the Contemporary Human Sciences*, that Bhaskar put forward this model. Expanding on the concepts described above, he stated that: "Society must be regarded as an ensemble of structures, practices and conventions which individuals reproduce or transform, but which would not exist unless they did so" (Bhaskar 1979, p.39). So, while social structures and human agency are irreducible, there are constraining and enabling factors at work within society that lead to the abovementioned reproduction or transformation of social forms. Archer used the term "non-conflationist" (1998, p.373) to describe this irreducibility of structure and agency, while emphasising the importance of temporality in the TMSA.

Bhaskar elaborated on his original TMSA in *Dialectic: The Pulse of Freedom* (1993) and included the aspects of causality, space and time, but ultimately what emerged was the Social Cube (Bhaskar 1993, p.160) which is comprised of Bhaskar's model of the 'four-planar social being'. This model can be used to understand social life and human nature and it allows for processes in society to occur on a number of interlinked levels in the context of a holistic ontology. The Social Cube "demonstrates that life in general is not determined by a single level (plane) of reality" (Piiparinen 2006, p. 426) and the processes at work are related

through synchronising mechanisms such as the generative mechanisms that were discussed earlier in this chapter. Social life includes decision-making which is a key aspect of this research into up-skilling opportunities and practices and in the following chapters, the decisions that were made by the participants in the nine case studies will be explored in detail. In Chapters Five, Six and Seven, the findings are synthesised using the four-planar social being as a guide for discussing the relevant trends that emerge. The four ontological planes are depicted in Figure 3.1 and each plane or dimension is elaborated below.



[a] = plane of material transactions with nature

[b] = plane of inter-intrasubjective [personal] relations

[c] = plane of social relations

[d] = plane of subjectivity of the agent

Figure 3.1: Four-planar being encompassing the 'social cube' (Bhaskar, 1993, p.160)

The Social Cube includes an explicit temporal element ('t') not present in the original TMSA, as well as an element of space ('s') and with regard to the Social Cube, Bhaskar explained that "every social event happens in at least four dimensions" (Bhaskar & Parker 2010, p.9). These dimensions are described in more detail here:

- Plane [d] – subjectivity of agent: Here we are concerned with the stratified self. Drawing on Bhaskar, Norrie (2010) explained that: "first there is [an individual]'s life narrative, her biography. Second there is her stratified internal personality taking the form of 'the lagged causal efficacy of her unconscious, her unwritten biography'.

Both elements go towards… the stratification of her personality" (Bhaskar 1993 in Norrie 2010, p.115).

- Plane [c] – social relations: This incorporates an agent's engagement with structures, institutions and forms (ibid.). Shipway (2001) described this plane by saying "structures and mechanisms in the social world are just as concretely real as the objects in the intransitive realm of the natural sciences (although perhaps not as enduring); and ... can have natural tendencies and properties which are just as causally efficacious" (p.66).
- Plane [b] – inter-intrasubjective (or personal) relations: Here we consider an agent's relationships or "transactions with ourselves and others" (Hartwig 2007, p.421).
- Plane [a] – material transactions with nature: Bhaskar explained that this plane involves "material objects generally" (1993, p.209) but also describes constraints that can include "the laws of nature, and the material, ecological, [spatio-]temporal, entropic and axiological asymmetries to which social life is subject" (ibid.). It should also be noted, with regard to this plane, that the nature of natural and social objects determines our mental possibilities of obtaining knowledge of them (Bhaskar 1998).

This aspect of materiality, along with the other concepts of social and personal relations, subjectivity and agency will provide the tools and discourse to add further depth to this research, while showing the importance of the way in which the substantive theories and sensitising concepts work together with critical realism.

3.2.4 Stratified reality and practices

By recognising that the reality which we experience is not socially constructed but is layered and shaped by deeper, often hidden, generative mechanisms, we can consider practices "as being historically, culturally and materially located, and not simply as relativist 'social constructions'" (Lotz-Sisitka 2009, p.357). This thinking around practices ties in with the definition of 'practice' proposed in the following section on practice theory and practice architectures as well as with the four-planar social being model that was described above. By considering practices as 'materially located', we can explore the concepts and issues around up-skilling in the marine sector in a unique manner. To further the focus on materiality, aspects of socio-materialism and its associated ontology are incorporated into this research. It is used in the traditional sense, but also with an emphasis on the particular marine and coastal

ecosystems that are involved in this research. This relationship between a stratified reality, practices and materiality does not intend to take away from the social processes involved, but it allows for an exploration of emergent properties by critical realist researchers who are interested in the intricacies of the practice and its context. Working with critical realism, the TMSA and practice theory, when investigating up-skilling opportunities and *practices*, adds a valuable dimension to this study as it allows for depth probing of the phenomena. Furthermore, a socio-material approach is useful for highlighting the importance of our 'material transaction with nature' as the Social Cube describes it. Socio-materialism has also been described as "practice-focused" by Fenwick and Edwards (2013, p.50) and this is explored further later in this chapter.

3.3 Practice theory: Investigating up-skilling opportunities and practices

With critical realism as the underlabouring meta-theory, and while keeping in mind the three domains of reality and the TMSA/Social Cube, I decided to draw on practice theory as a substantive theory to further interpret the up-skilling opportunities and practices in the marine sector of South Africa. In particular, the work by Stephen Kemmis on a theory of practice which he described as being embedded in '*practice architectures*' (Kemmis & Grootenboer 2008). These architectures are orders of cultural-discursive, material-economic and social-political arrangements that prefigure and shape the conduct of practice (Kemmis et al. 2009). Kemmis termed these determining, distinctive orders as 'sayings', 'doings' and 'relatings' and they are characteristic of a particular practice, in this case, up-skilling.

By analytically applying Kemmis' theory of practice architectures to the data collected during interviews, document analysis and key observations, I have been able to uncover the less obvious aspects of the up-skilling opportunities and practices, as well as the formal and informal learning that takes place, in the marine sector (see Chapter Five). According to the theory of practice architectures, practices are organised bundles of 'sayings', 'doings' and 'relatings' that 'hang together' (Schatzki 2002, Kemmis & Heikkinen 2011) in the overall project which is the ultimate purpose that gives coherence to the practice in question. The discourses or bundles of 'sayings' look at how practices are shaped by the words that are used in professions or by professionals when they name and describe particular things, in particular ways, noting certain aspects of the world which are relevant to their work, while giving less attention to other aspects (Kemmis 2005). Many of these concepts stem from Theodore Schatzki (1996, 2001, 2002) who saw 'bundles' of sayings and doings (and

Kemmis & Grootenboer, 2008, added relatings) as significant and meaningful to, and highly valued by, those involved in the practice. Therefore, Kemmis (2009b) defined practice as "socially and historically constituted and as reconstituted by human agency and social action" (p.21). This definition includes the concept of agency which was discussed in Chapter Two and which plays an important part in the understanding of practice and the way in which I use it for this research.

Both Billet (2008) and Kemmis (2009b), as well as earlier work by Lave (1990), also described how practices influence an individual's identity. In Lave's study, it was through the experiences of apprentice tailors, living and working in their masters' houses and workshops and she described how these apprenticeship forms of learning "are likely to be based on assumptions that knowing, thinking and understanding are generated in practice, in situations whose specific characteristics are part of practice as it unfolds" (Lave 1990, p.19). This ties in well with one of the key features that Kemmis (2009b) identified through his work on professional practice, that is:

> Practice is always embodied (and situated) – it is what particular people do, in a particular place and time, and it contributes to the formation of their identities as people of a particular kind, and their agency and sense of agency. (p.23)

The details given above are, primarily, describing the 'doings' of practice architectures and Kemmis went on to describe how the physical and material circumstances shape the 'doings' to a large degree, and indeed, not only the doings but also the semantic space of the sayings and the social space of relatings. These circumstances could be considered *external* to the intentional actions and knowledge of the participants involved in the practice, but Kemmis (2011) argued that if we take practice as always situated (or in what Schatzki calls 'site ontologies', 2003, 2005, 2006), then practitioners are in an interdependent relationship with the other species, objects and people that influence the practice. Previously, Schatzki (2002) emphasised this relationship where he spoke of practices and in the title of his book, used the term "the site of the social", to describe how practices are a place where people and other things meet and interact. In other words, the practice is "not just held together in the sayings, doings and relatings of a single person, but both distributed and held together in discursive, material and social interactions among people who are connected to one another in and by the practice" (Kemmis & Heikkinen 2011, p.4).

3.3.1 Background and context of practice theory

To fully understand the significance of the sayings, doings and relatings of practice architectures, one must understand the work that led to the development of this theory and these orders. The influence of Theodore Schatzki has already been made clear in the previous section but Kemmis et al. (2014) emphasised that "our theory of practice diverges from Schatzki's in a number of ways" (p.28) and it is for this reason, more detail is required about the background and history of the development of this theory of practice. If one delves into the other influential theorists that lead to this working theory of Kemmis', we find work done by Habermas (1972) on the three stable dimensions of human society where he discussed the three social media of: language, work and power; and furthermore work by Bourdieu (1990, 1998) who explored cultural and symbolic; economic; and social and political capitals and fields. Bourdieu (1990) also referred to the cultural-discursive framing of actors' meanings and intentions in his book entitled *The Logic of Practice*, and this framing links with the notion of 'sayings', but as Kemmis (2005) pointed out, Bourdieu presupposed ideas around the nature and structure of the practice in question. Bourdieu formulated a notion of *habitus* (see Figure 3.2 where Hemmings et al. 2013, referred to 'habitus') which involves a set of historically and institutionally constituted predispositions that allow a 'player' to enter the particular field or setting where the practice will take place (Kemmis 2005). Schatzki disagreed with this element of Bourdieu's structuralism, which suggested that social fields have an independent existence that structures action and interaction, and instead, argued that it is the actors who constitute practices through their action and interaction (Kemmis & Mutton 2012). However, Schatzki proposed that practices prefigure people's activities and likened it to a path through a forest that offers "an easier way through, but also is itself able to evolve – as, for example, when a tree falls across the path and subsequent walkers make a new path around the obstruction" (Kemmis & Mutton 2012, p.191). It must be noted, nevertheless, that Schatzki maintained that what makes the path (in the above metaphor), is the walking of those who pass down it, not in essence "the (externality of the) indentation in the ground that they tread on" (ibid., p.191).

This metaphorical path can be roughly equated to the up-skilling opportunities that I am researching in South African marine and coastal organisations, while the actions, interactions and professional practices of the employees, make up the activities that Schatzki refers to. It is essential to consider what enables, constrains or 'interrupts' the path and how learning occurs in this specific situation or social field. Kemmis (2009b) insisted that practice is

always transformative and should change the existing state of affairs through the spaces occupied by sayings, doings and relatings, but that the consequences are always greater or lesser modifications in people's understandings, physical circumstances and social relationships. It is through examining the practice architectures that are laid down and occupied or 'inhabited' (Kemmis & Mutton 2012) by the people involved in the practice that we can gain a deeper and more meaningful understanding of the learning that occurs in, through and for the workplaces that I am considering in this study.

Hemmings et al. (2013) proposed that practices involve 'practice landscapes' that are composed of the arrangements previously mentioned (cultural-discursive, material-economic and social-political) and these arrangements are found in the various sites where the practice occurs. Also involved are 'practice traditions' that "change and perhaps evolve over time in such a way that the practice reproduces and transforms itself to become adapted to changing times and local circumstances" (Hemmings et al. 2013, p.475). These terms are used to describe how the arrangements are bundled together in characteristic ways in a particular practice (see Figure 3.2 below). Another consideration of practice architectures is the site of the practice or the 'niche'. Kemmis and Heikkinen (2011) borrowed this word from ecology when they put forward the idea of 'ecologies of practices' and argued that practices can be understood as similar to living things. They considered a niche as the environment and its functional content that provides an organism, or a practice, with the conditions it needs to survive. However, they also believed "a suitable niche can exist and then be colonised by a practice (as when a school that has been closed re-opens, and classroom teaching once again comes to exist there)" (Kemmis & Heikkinen 2011, p.16). They went on to explain that this relationship is complex and only occurs due to human agency and thus, in many ways, practices play a role in building the niches that support them through a process of evolution and interaction. These concepts are mentioned in the figure below, along with the overall structure of practice theory according to Kemmis and co-authors (and drawing on Schatzki's practice theory).

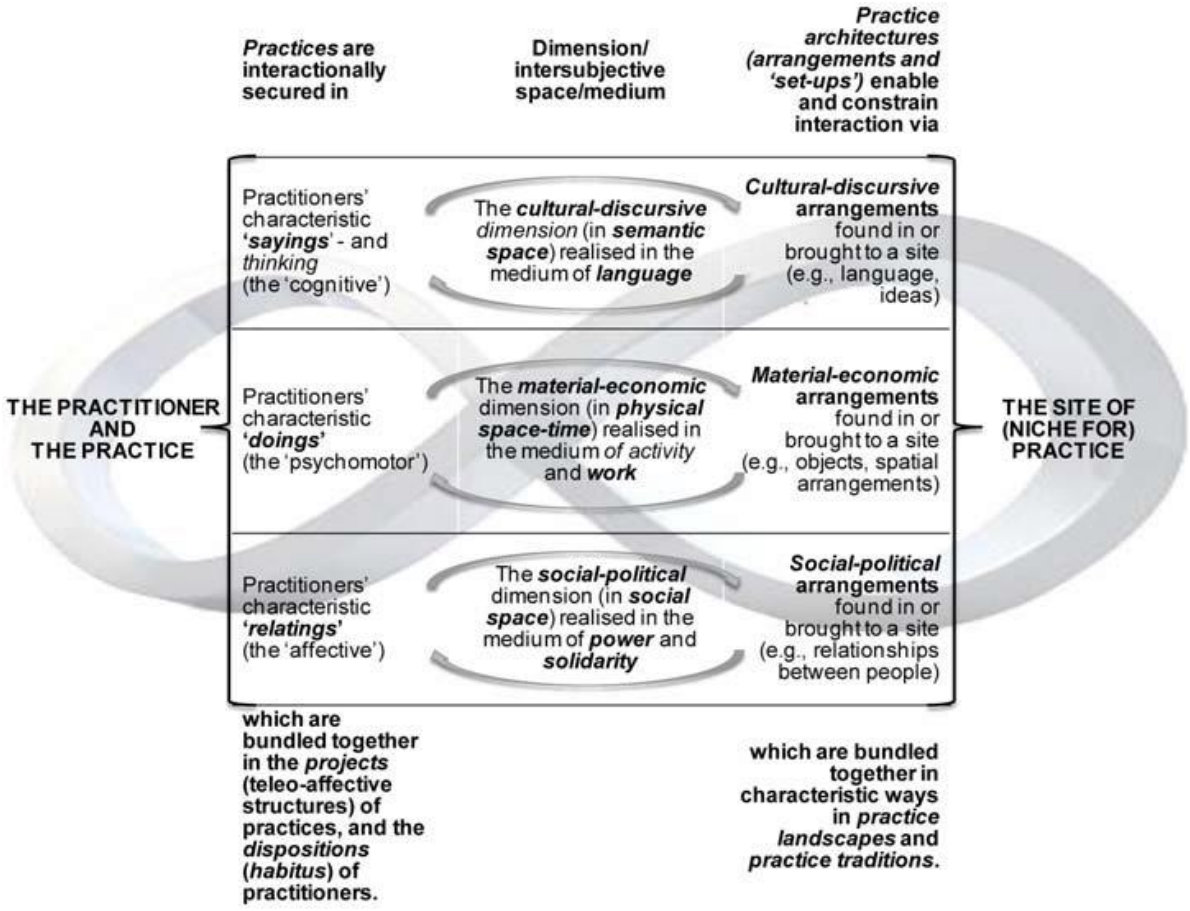


Figure 3.2: Theory of Practice Architectures (from Hemmings et al. 2013, p.475)

By working with the concepts that practice theory provides, it is possible to gain a well-rounded view of the practice in question and through careful consideration of the dimensions presented in the framework above, one can gain a clearer picture of what constitutes and is important in a particular practice. When examining up-skilling opportunities, it was apparent from the early, conceptual stages of the research that the associated practices would play a significant role in the study and it is for this reason that I commonly refer to up-skilling opportunities *and practices*. One can consider 'practice' as being at the heart of up-skilling, as well as the related fields of professional development, workplace learning, skills development and training, and human capacity development. It is understandable, therefore, that Kemmis (2011) argued for a more encompassing view of practice in his chapter entitled: What is Professional Practice (in the book published in 2011, *Elaborating Professionalism*). With a wider perspective of what practice and especially professional practice, entails, researchers in different fields can use the concepts put forward by Kemmis and colleagues to investigate a multitude of issues or subjects.

Table 3.2 shows the findings of study done by Kemmis et al. (2009) where they explored the transformation of educational practices through changes in practice architectures in a school environment. This example of findings grouped according to the sayings, doings and relatings of practice architectures helped in guiding my analysis and it was of interest that they added a fourth section where they show how these dimensions relate. My research into up-skilling opportunities and practices followed similar concepts but considered aspects of learning in the context of workplaces and the marine sector of South Africa.

Table 3.2: An example of how the 'sayings', 'doings' and 'relatings' of practice architectures, can be used to interpret findings in a school environment (taken from Kemmis et al. 2009, p.6)

Table 1: Changes in sayings, doings and relatings to establish 'professional learning communities' of system and school leaders, teachers and students

Sayings	Changes in the ideas about how leadership and learning was to be understood in the Diocese – e.g., the notion of 'professional learning communities' and the six principles noted earlier, and, with students, ideas like 'interdependency' as characteristic of collaboration in group work.
Doings	Changes in how things are done – e.g., collaboration in a variety of different kinds of activities, from staff performance management (now via professional learning plans) through to working via planning teams among school staff (with simultaneous release from teaching for shared planning) to (interdependent) group work in classrooms.
Relatings	Changes to how people relate to one another – e.g., from more hierarchical to consciously inclusive working relationships between staff in working teams (explicitly modelled by the CSO officers, by principals and school executive groups, and by groups of staff working on development projects), and between students in classrooms. These work relationships often extended to staff who had not previously worked together, and students who were not necessarily already friends.
How this 'hangs together'	Changes in sayings, doings and relatings that 'hang together' to form new ways of working – e.g., collaborative group work in various kinds of (small to large) 'projects for staff (shared development projects, for example) and for students (Year 6 as "all leaders' without school captains, as well as classroom projects of various sizes, for example). In fact, at each level, it appeared that a 'professional' ethos of collaboration was beginning to permeate working relationships between the CSO and schools, among staff in the schools, and among students.

3.4 Taking a socio-material approach to professional practices

The focus on materialism and, in particular, socio-materialism, provides finer resolution to the theoretical foundation that has been laid by Critical Realism and practice theory. From the earlier description of the Social Cube and the TMSA, it is clear that Critical Realism focuses on the material as well as the social and therefore, it can be taken as a socio-material theory. Practice theory also has the material-economic dimension which includes spatial and temporal elements (in a similar way to the Social Cube). Thus I draw on socio-materialism to emphasise the importance of not only the physical marine environment, but also the other *material* aspects that influence the working lives and up-skilling opportunities of marine professionals.

In Chapter Two, materiality in relation to agency was discussed and reference was made to Karen Barad's understanding of agency and agential realism, where we can examine the world, our scientific knowledge and the processes of materialisation through a modified realist framework. Barad's work on agential realism has been labeled as a "new materialism" theory (Hollin et al. 2017) and it has influenced socio-material researchers such as Tara Fenwick. As will become apparent, I rely on much of Fenwick's research into professional practices and education for this aspect of the thesis. To fully grasp the genesis of socio-materialism, it is necessary to explore the work that came before and this is undertaken in the following section.

3.4.1 New materialisms: From quantum physics to social theory and practices

New materialism has emerged over the past 20 years as an approach which is focused firmly upon social production rather than social construction (Coole & Frost 2010) and new materialist theories are committed to finding new ways of thinking about matter and processes of materialisation within posthumanist ontologies. The argument is that new ways of investigating material reality are essential if contemporary society is to understand and face up to the urgent challenges regarding environmental, demographic, geopolitical and economic change (ibid.). The new materialist ontology penetrates the mind-matter and culture-nature divides of transcendental humanist thought (van der Tuin & Dolphijn 2010) and by opposing these social theory dualisms, it contests traditional anthropocentric values and concepts. It also moves towards answering the questions about "the nature of matter and the place of embodied humans within a material world" (Coole & Frost 2010, p.3) but without privileging

human bodies. Coole and Frost (2010) also described materiality as plural, open, complex uneven and contingent. They pointed out that new materialist ontologies "understand materiality in a relational, emergent sense" (ibid., p.29), with a focus that extends from globalisation to issues of identity.

Karen Barad's work follows these same principles mentioned above, and as a physicist-philosopher, she has worked to deconstruct a series of categorical oppositions, such as nature/culture, subject/object, knower/object-to-be-known, human/non-human and realism/social constructivism (Geerts 2016). Bhaskar's dialectical critical realist (1993) work which produced the social cube, also addressed the prominence of dualism in social research. The difference is that Bhaskar's work offered a differentiated and stratified relational ontology as a foundation for a theory of emergence, whilst Barad's work offers a flatter, immanent relational ontology. In her book, *Meeting the Universe Halfway: Quantum Physics and the Entanglement of Matter and Meaning* (2007), Barad laid down the foundations of her quantum physics-inspired feminist philosophy and reflected on the debates of the cultural turn and how it prioritised the discursive and the representational; she explained that "language has been granted too much power" (p.132). She made her point by saying: "Language matters. Discourse matters. Culture matters. There is an important sense in which the only thing that does not seem to matter anymore is matter" (Barad 2003, p.801). To move away from the representationalist 'trap' as she calls it, Barad proposed a performative understanding of discursive practices that challenges the belief in the power of words to represent preexisting things. Performativity is "precisely a contestation of the excessive power granted to language to determine what is real" (ibid., p.802). With this move, comes a shift from reflection to diffraction, which is where Barad's quantum-take on the relationship between matter and meaning begins to play a role. The notion of using diffraction to think about differences that matter originates in work by Haraway (1997) and it can be said that within diffractive approaches there is no pre-given distinction between worlds and words, but instead, measuring devices, words, and things are thoroughly entangled and co-constitute one another (Hollin et al. 2017).

Barad recognises the importance of social constructionist insights but wants to rectify the problem of reducing everything to social discourse where little or no attention is given to the materiality of our bodily existence (Calvert-Minor 2014). She described the move towards performative alternatives as one which involves focusing on matters of: practices/doings/

actions, rather than questions of "correspondence between descriptions and reality (e.g., do they mirror nature or culture?)" (Barad 2003, p.802). Furthermore, she commented on practices:

> There is an important sense in which practices of knowing cannot be fully claimed as human practices, not simply because we use nonhuman elements in our practices but because knowing is a matter of part of the world making itself intelligible to another part. (ibid., p.829)

This approach of Barad's not only highlights the importance of practices and resonates with the way in which practice theory plays a critical role in this research, but also touches on the production of knowledge and how we come to know about reality. Hollin et al. (2017) summarised Barad's philosophy as follows:

> Baradian onto-epistemology, with its notions of agential realism and intra-action, works hard, then, to establish a lively and worldly substratum, which, despite its mysterious nature, is testable and trustworthy. Objects, entities and phenomena are demonstrably instantiated in and by material practices, produced performatively in concrete situations and thus – crucially – can anchor political actions. (p.924)

In the case of this research, the phenomenon of interest is up-skilling opportunities and practices in the marine sector of South Africa and it is the concrete situations, material practices and everyday realities of the marine professionals that I explore. Here the materiality of the marine environment matters and shapes the professional lives of people who become marine professionals, as will be highlighted in subsequent chapters.

3.4.2 Learning in the workplace and material practices

One of the trends in workplace learning research that has arisen since the 'practice turn' that was described in Chapter Two has been to consider knowledge in professions as practice-based (Fenwick 2010a). This is important when researching how *learning* is related to up-skilling opportunities and practices in the marine sector. Keeping in mind the model of the four-planar social being and what has been said on new materialisms above, Fenwick et al. (2011) reaffirmed that both social and material relations are entwined in bringing out professionals' practice. Fenwick also set out to highlight the importance of materiality in day-to-day work and life and she argued that socio-material perspectives of knowledge encourage a refocusing on the relations *between* things, rather than the things themselves (Fenwick 2009). The relations between (and to) the social and material are tightly knit, so much so, that they cannot always be distinguished from one another. Fenwick described it as follows:

> The material includes tools, technologies, bodies, actions, and objects, but not in ways that treat these as 'brute' or inherently distinct from humans as users and designers. The material also includes texts and discourses, but not in ways that focus on linguistic, intertextual and cultural circulations that preoccupy post structural analyses. Overall, this shift is away from a primary preoccupation with human meaning including meanings attributed to such objects, as we see in hermeneutic, narrative or symbolic interactionist approaches. (2010b, p.104)

By acknowledging that work life is fully entangled with material practices, as well as the 'things' that are in and around the workplace, one can create a new or expanded understanding of human activity and the meanings that are generated from work activities (Fenwick 2010b). Fenwick argued that this new understanding involves focusing on the material in a way that reveals the true or fuller scope of dynamics that constitute everyday life, including learning. She pointed out that what humans take to be their 'learning' and 'social' processes are not separate or distinct from the contexts of their work and these processes should not be "dismissed as a wash of material 'stuff' and spaces" (Fenwick 2010b, p.105). She went on to explain that it is the very things that make up these contexts and even the actions and bodies (including human ones), that are part of these assemblages, that bring forth objects and knowledge by continuously acting upon each other.

These entanglements with meanings and materials are especially unique in an ecological setting such as the marine and coastal environment and the activities and meanings will differ between individuals in an organisation and between the organisations themselves. The objectives and goals of an organisation or institute will often determine how the employees interact with the material aspects of the workplace but also, I propose that the work life of marine professionals is especially 'hands-on' and their practices are greatly influenced by the role of the material, which in this case, is the marine environments that they are focused on and work within. For example, the scientists at SAIAB have been conducting research in marine, offshore environments and this involves working with specialised equipment and the trained technicians who operate this equipment. Beyond these practicalities, the biological and geographical expertise are also essential for this research and this results in the scientists working closely with the technicians as well as other experts in the marine sector.
Thus, it is essential to explore the socio-material relations in the research findings of this study, and I consider marine science and management as a socio-materially shaped professional practice.

Although SAIAB focuses on the full spectrum of aquatic environments, they do much of their research in the marine, offshore environment and work closely with the 'Elwandle' Node of SAEON. The Elwandle Coastal Node is mandated to undertake long-term monitoring and research in South Africa's coastal zone and together with SAIAB strive to detect, understand and predict environmental change in the country's coastal ecosystems.

Globally, and across sectors, there have also been social and socio-technical revolutions that have influenced the workplace and the knowledge that is required in day-to-day work life, such as information technology, which has transformed modes of doing business, the nature of services and products, the meaning of time in work, and the processes of learning (Fenwick 2001). As Fenwick put it, these transformations have "contributed to a belief that knowledge and continuous innovation are key to survival" (2001, p.4). Therefore, workers are pressured to learn and adapt and 'flexibility' is a dominant theme among accounts of contemporary workplaces (ibid.). It should be noted that the transformation Fenwick refers to here is specific for the processes of learning along with the other aspects of work mentioned above and the transformations have led to a change in some workers' belief systems. Kemmis talked of transformative practice in a slightly different way and said that the "transformation of practices involves transformations in how people understand their practices, what they do, and how they relate to one another in the practice" (Kemmis 2009a, p.5). So, although there are similarities in the concepts involved and both are centred on practices, transformation is approached from differing perspectives. This does not cause any contradiction for this research but allows for a well-rounded view of transformation and its various meanings and nuances for up-skilling and workplace learning in the marine and coastal organisations that form part of this study.

Billet (2000) reiterated the importance of deliberating over the relations between individuals and the social world in which they act and he noted that opportunities afforded by the workplace can include "tricks of the trade and conceptual knowledge that is opaque" (p.1). This can make it difficult to evaluate a professional's knowledge and it is often assumed that learning is an individualistic process of acquiring new knowledge and skills and that participation in activities or events designed for professional development will produce this learning (Fenwick 2009). These assumptions lead to decisions about what knowledge is worthwhile for a professional to learn and then often, the shifting contexts of their practices are ignored (ibid.). In her work on assessment in professional continuing education, Fenwick

(2009) argued that when assessing guided learning we often have conceptions that "fail to recognize aspects of practice and knowing that clearly *are* distributed, emergent, and rooted in material as well as social connections" (p.2). The guided learning she spoke of can be associated with up-skilling opportunities and practices in the context of this research and when examining the quote more closely, there are clues as to how socio-materialism relates to concepts in both practice theory as well as critical realism. This will be explored further in the following section.

3.5 Theories working together for a deeper understanding of up-skilling opportunities and practices

Fenwick (2009) talked about practice and knowing being emergent and originating from material and social connections, while Kemmis and co-authors referred to social-political, as well as material-economic arrangements (relatings and doings, respectively) as part of practice architectures. Although used in slightly different ways, the material aspects and the significance of the 'social' certainly overlap in these theories around practice. In both cases, I am proposing the inclusion of an ecological aspect, so in practice architectures, *doings* might read as "material-economic and ecological" arrangements and within the socio-material approach that Fenwick argued for, I would highlight the marine and coastal environment as an important part of the 'material'. These concepts are, in many ways, in line with the Transformational Model of Social Activity and the four-planar social being of critical realism and through careful consideration of how these theories complement each other, I hope to uncover the generative mechanisms at work in the marine sector of South Africa and in this way arrive at a truth that is as close to reality as possible (Danermark et al. 2002).

Figure 3.3 shows how critical realism forms the meta-theory that underlabours this research into up-skilling opportunities and practices in the marine sector, while the two substantive theories are socio-materialism and practice theory. This is not discounting the fact that critical realism is, in fact, a socio-material philosophical theory itself which underlabours for other theories, and this is made clear in the four-planar social being where plane [a] is one of material transactions with nature (see Figure 3.1). The sensitising concepts are linked to, and emerge from the theories considered in this research and provide finer details about the field of research. The substantive theories are shown to be overlapping and connected while both

serve as essential guiding theories and they equip the researcher with analytical tools, which are explored below.

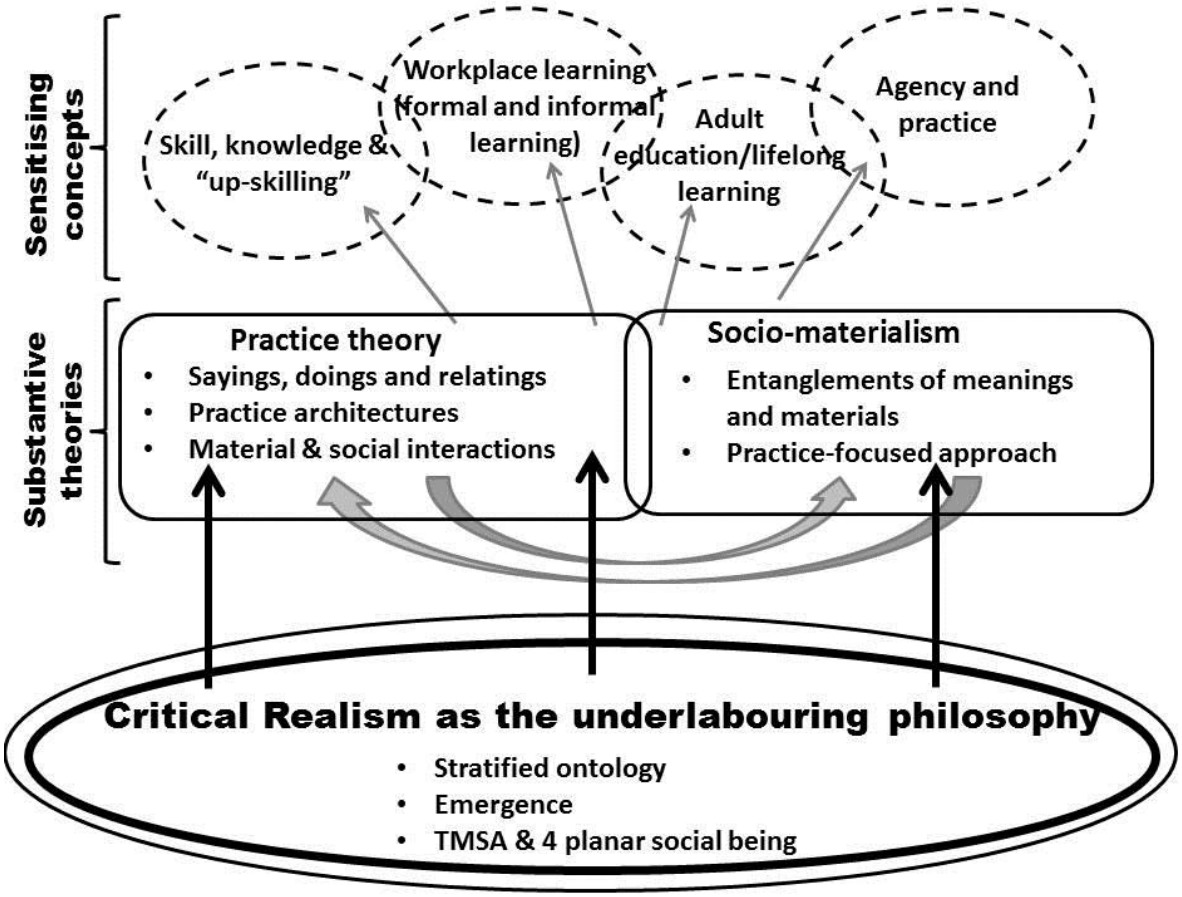


Figure 3.3: A schematic representation of the theoretical framework applied in this research

Working with the tools that practice theory provides, allows for rigorous analysis and exploration of the up-skilling opportunities and practices in the marine sector. In addition, a socio-material approach gives further insight into these opportunities and practices that lead to meaningful learning in the workplace by marine professionals. However, it is essential to acknowledge that practice architectures (and a socio-material approach, in this case) will not necessarily produce a smooth and flawless picture or story of what is occurring. Kemmis (2009a) used the example of the phrase "hang together" when talking about the sayings, doings and relatings of a practice. This does not automatically mean that the dimensions all "cohere entirely without contradiction or confusion in the saying, clumsiness in the doing, or conflict in the ways of relatings" (Kemmis 2009, p.5). These inconsistencies also may only

become visible after a long period of time when they emerge in the light of critical reflection (Kemmis 2009a).

As an example of how practice theory and socio-materialism can work together I turn to Fenwick (2012) who spoke of co-production in professional practice, where co-production is the process of services and products being co-developed with clients or service users. She discussed how, when examining these practices of co-production, "it makes sense to draw from the growing field of practice theory that is proving useful in examining professionals' everyday work" (p.3). However, she adopted a socio-material approach to the analysis of the challenges within these professional practices for the reasons stated below:

> Many existing studies of professional work have tended to focus on personal and social elements of knowledge and activity. In such analyses, material dynamics tend to be ignored, underestimated or isolated as though material artefacts are separate from and subordinate to human intention and action. Yet as many have argued in recent analyses of social life, work and knowledge, materiality fundamentally shapes practice and knowledge. (Fenwick 2012, p.3)

This substantiates the approach I put forward earlier when explaining the importance of the material in this research into the marine sector and the skills and practices that are involved. Via another example from a different context, one can consider the study by Hemmings et al. (2013) in which they explored the conditions shaping several kinds of practices in nine Australian universities with regard to teaching inclusive education as part of the initial professional development and learning of pre-service teachers. One of the aspects affecting the teaching of inclusive education they uncovered, using the practice architectures framework, was that of the physical arrangements of lecture theatres and how if the lecture theatre was tiered, this limited students with physical disabilities, such as those in wheelchairs (Hemmings et al. 2013). This was stated to be a clear example of a material condition that is constraining a practice, but the relatings or social arrangements in these teaching settings were also identified as important factors in the study.

3.6 Conclusion

With a focus on the socio-material, this research hopes to emphasise the significance of the material world in which the marine professionals carry out their work activities and practices. In this case, the 'world' of the marine professionals is made up of the marine and coastal environment and it is for this reason, I proposed the addition of the term 'ecological' to the

socio-material approach as well as the *doings* of practice theory. Chapter Four provides examples of what some of these ecological aspects might look like when describing the research participants and their areas of expertise. The uniqueness of the 'material' in this research influences the practices as well as the learning and knowledge-production that take place in the organisations and institutes. Ultimately, the up-skilling opportunities and practices all revolve around the marine and coastal ecosystem so it follows that this should be an important part of the study.

The links between critical realism, the four-planar social being, materiality and practices are vital to this research and allow for a thorough investigation into the practices of up-skilling and workplace learning that forms the basis of this doctoral study. In general, the theoretical framework outlined here aims to enrich the study and uncover what lies beneath the observable events and experiences. By gaining a deeper understanding of the mechanisms at work in the workplaces of interest, the research questions that were described in Chapter One can be addressed. The main research questions, along with the sub-questions, guide the research and give direction to the methodology that is explained in Chapter Four. Thus, the following chapter presents the analytical framework and gives a detailed description of the methods used in this research. With the tools provided by the substantive theories, the socio-material/ecological approach and by viewing the findings through the lens of critical realism, the data can be discussed in such a way that a meaningful contribution can be made to the fields of workplace learning, professional development and adult education.

CHAPTER FOUR – Research design and methodology

4.1 Introduction

Chapter Three outlined the theoretical framework and presented the perspectives that were used to approach this research into up-skilling opportunities and practices of marine and coastal organisations in South Africa. In Chapter Four I explain the rationale behind the research design, the criteria used for selecting the cases, the research sample and who I approached in each organisation. I provide a closer look at how the decisions were made with regard to the participants in the study, before going on to describe the methods that were used to gather and analyse data. The data generation phase of a study is critically important and thus great care is taken in clarifying what tools were used during this phase and how they were implemented for this particular study. The relevant data generation tools here are semi-structured interviews, document analysis and selected observations. In addition, the contextual profiling phase is described as this is an essential part of the research process in qualitative studies.

In this chapter, I also discuss aspects of validity and evidence as well as ethical issues that were taken into consideration. It is important to note the strengths and limitations of the research design and acknowledge the role of reflexivity in the research, including the positioning of the researcher, and I do this towards the end of the chapter. The links between the theoretical framework and the way in which the data were managed and analysed are imperative in a doctoral study and I begin by considering how critical realism shapes the methodology of the study. Furthermore I elucidate how a socio-material approach influences the research design along with the relevant learning theory and the sayings, doings and relatings of practice architectures.

4.2 Implications of critical realism for research design and analysis

Critical realism talks of intensive research designs, which are mainly constituted as qualitative studies and are orientated towards revealing causal mechanisms (Danermark et al. 2002, Sayer 1992). By focusing on generative mechanisms, an intensive approach can explore the complex issues that are common in the social sciences and instead of studying many cases, fewer cases are studied but in more depth (Danermark et al. 2002). This in-depth tracing of generative mechanisms can also be described as searching for the preconditions of the *real*, and this leads

to a more universal understanding of human action, rather than details about a unique situation. Flyvbjerg (2006) pointed out that there cannot be predictive theory in social sciences and although there is an absence of 'hard' theory or proof, learning is definitely possible. Therefore, it can be said that by focusing on the transcendental preconditions of the cases (and across cases), it is possible to provide some level of generalisation within a real-world-context, including any complex conditions related to the case, or cases (Danermark et al. 2002, Flyvbjerg 2006, Yin 2012). The sort of generalisation referred to here, is the "general" that must be "sought in the structures making up the constituent properties of social relations" (Danermark et al. 2002, p.113) and in my research these social relations would be those surrounding up-skilling opportunities and professional practices.

Retroduction plays a vital role in this procedure of generalisation and in critical realism this is considered to be "a method for finding the prerequisites or the basic conditions for the existence of the phenomenon studied" (Danermark et al. 2002, p.11). Retroduction, along with abduction, are not logical modes of inference (like deduction), but provide a more comprehensive way of reasoning, arguing and relating the individual, or singular, to the universal or general (ibid.). While abduction is a method where re-description and re-contextualisation are the central elements, retroduction takes this further by constructing explanatory accounts of the phenomena and is thus a significant mode of inference used by critical realists. It is through analysing particular events and actions that researchers can construct the abovementioned accounts and move towards a more in-depth description of the underlying mechanisms, which is ultimately what critical realism strives to uncover. It must be noted that deduction has a role to play in our thinking, as researchers in social science, due to it giving us universal guidelines for what is required for a logically valid argument and these guidelines can be used to test the legitimacy of the claims made by means of other methods of inference, such as retroduction (Danermark et al. 2002). These modes of inference were kept in mind when designing this research and because critical realism was being used as an underlabouring theory for the overall study, retroduction was employed when analysing the findings of my research into up-skilling opportunities in the marine sector. In addition, the TMSA and the Social Cube were used to synthesise and collate the findings at the end of Chapter Six.

4.3 What a socio-material approach and practice architectures means for research design and the role of learning theory in this study

Along with critical realism and its stratified ontology and four-planar social being (or Social Cube), a socio-material approach influences the research design and how data analysis takes place. Practice theory and the practice architectures that have been described also form a central part of the methodology outlined below. Another question to ask is what role does learning theory play in this relationship between the theories being put to work here and the underlabouring philosophy? I suggest that the link between a socio-material approach, practice theory and critical realism can be seen in how people often have to manage and balance different but overlapping realities in practice settings (Fenwick 2010a). If these practices lead to, or are in fact, a form of up-skilling, then understanding the learning that takes place, is essential. An example of the importance of the materiality of learning is how digital media has drastically changed the workplace and particularly workplace learning (ibid.). Fenwick (2010a) described how technologies such as digital media have become "intimately entwined with work activity and knowledge sources" (p.86). These developments undoubtedly influence the learning that takes place and as Fenwick argued, incorporating the material should be a prerequisite when considering learning theory. Therefore, the role that learning theory plays in this research is comparable to the description in the quote where Fenwick outlined the meaning of *learning* in the *European Journal for Research on Education and Learning of Adults* (Vol. 1): "This issue features articles that take learning to be the ongoing configurations and reconfigurations of practice – unfolding, emergent, situated in activity, acknowledging the important mediating function of artefacts but still focusing on the human interactions of activity" (Fenwick 2010a, p.86). This notion of learning draws together the ideas of critical realism, socio-materialism, agency and practice theory and it is from this point that I move forward with learning theory in this research. These concepts are particularly useful when considering the up-skilling opportunities and practices in the different cases and will be discussed in more detail in Chapter Seven.

With regard to the theory of practice literature, educational practices are commonly studied by looking at specific cases (see Kemmis et al. 2014) and the learning that takes place in these cases is often one of the major components of the practice that is being studied. Research looking at practice architectures regularly interrogates the changes in the practices of interest and these shifts in the sayings, doing and relatings result in new arrangements of things and resources brought about by the new requirements of the practice (Kemmis 2009a).

Throughout all this, learning takes place and the traits from the aforementioned quote (Fenwick 2010a) can be seen coming through. Practice architectures prove themselves worthwhile when it comes to research design and data analysis by questioning what shapes practices and commonly, the cases studied, involve professional development and professional learning (see Kemmis et al. 2009, 2014, Kemmis & Heikkinen 2011, Kemmis 2012, Kemmis & Mutton 2012). The goal of this doctoral research was to understand, i.e. *learn* how up-skilling opportunities and practices facilitate the professional development of managers and scientists in marine and coastal organisations and research institutes of South Africa. Furthermore, the research design was greatly enriched due to the combination of the abovementioned theories and approaches and the contributions each made to the data collection and analysis phase of the research was invaluable.

4.4 The case studies, criteria for selection as a case and the research sample

As has been described in relation to critical realism and generalisation, a case study approach is helpful when conducting research that aims to find the underlying generative mechanisms for a contemporary phenomenon such as up-skilling. Thus, this research was designed as a case study, where a *case* was taken as an organisation or institute where the up-skilling opportunities and practices (and associated learning) were examined through the primary method of semi-structured interviews of certain staff member of these organisations. Appropriate documents were included where possible and this gave insight into the formal up-skilling opportunities and practices present in these organisations (see Sections 4.4 and 4.5 for more details on data collection and analysis). In total, 18 marine professionals participated across nine case studies and below I describe how the organisations were chosen and who the participants of the cases were.

In general, the organisations or institutes that made up the cases had a marine or coastal/oceanographic mandate and in some instances, this meant studying a particular branch or department of a larger conservation or governmental agency. The organisations were of different sizes but the criteria I looked for in a possible organisation (other than the marine mandate) were that they had a national presence or at least a large role to play in one of the country's coastal provinces. Availability of participants within each organisation or institute was also a determining factor when it came to which organisations were ultimately included; this is discussed further when discussing limitations of the research design. The reason

behind regularly using the phrase ‘organisations or institutes’ is due to the fact that two of the nine cases are research institutes that consist mostly of scientists, while the other seven are some form of organisation where the participants were managers, scientists or programme directors or a combination of these. Occasionally, I only refer to ‘organisations’ but it must be noted that this then, generally includes the research institutes.

4.4.1 Research participants

Purposeful sampling of specific professionals in marine organisations and research institutes was carried out in accordance with the Biodiversity HCDS (SANBI/Lewis Foundation 2010) which notes that organisations often find it most difficult to retain staff with high-level skills (relating to the scarce skills discussed in previous chapters). Where possible, I approached senior managers and/or scientists in the hope that by working with more experienced individuals in this category, I would discover which up-skilling opportunities and practices they had found to be most effective, relevant and valuable to their careers in the marine sector.

In Chapter One the institutes and organisations were introduced and background information was given for each one. The relevant marine/coastal branches or programmes of each case were also mentioned and in this sub-section I go on to outline who I interviewed in each organisation, their research interests and the links between these organisations and the observations that were made during the data collection phase of the research. For many of the organisations and especially for the research institutes, the research topics or interests are best described through presenting some examples of the peer-reviewed papers or technical reports that have been published by the participants and their colleagues as this reflects the focus and depth of their engagement in the marine sciences sector, helping also to articulate their engagement with the materiality of the marine environment which lies at the heart of their professional praxis. In addition to these, I refer to the documents associated with each case but these are described in more detail in Section 4.5.3, when discussing data generation tools. The coastal provinces of South Africa are identified in Chapter One, Figure 1.1, and the cases were also selected due to their locations in and across these provinces, with the Northern Cape as the only province that is not represented in the cases.

Case study 1: ORI – Oceanographic Research Institute

For the purpose of this research into up-skilling and based on their mandate as described in Chapter One, it made sense to focus on ORI and the staff within the institute. Therefore, I sought out scientists and senior scientists in ORI, as well as interviewing the director of the institute. Initially I also spoke to the director of uShaka Sea World Education[6] who gave valuable background information into how the organisation was arranged and who I should talk to for my research into up-skilling. Due to ORI's focus being primarily scientific research, academic degrees were expected among the high skill-level staff members and most of the research participants were supervising at least one post-graduate student, either based at the institute or in collaboration with a university. The University of KwaZulu-Natal and the University of Zululand are the two universities that are closest to the institute, geographically, but ORI also has partnerships with other South African universities as well as international universities.

Over the space of two trips to ORI, I interviewed four scientists. The research interests of these scientists included, but were not limited to:

- Understanding the ecological relationships between coral reef fish and coral communities.
- Ecological, biological and management-related issues pertaining to (mainly) demersal fisheries in the Western Indian Ocean.
- Effects of climate and stochastic events on estuarine ecosystems.
- Specialist investigations to limit and mitigate development impacts on the health of coastal aquatic environments.
- Investigating the importance of Marine Protected Areas as management tools for coral reefs.

A number of ORI scientists and post-graduate students attended Observation V.2 (the SAMSS conference in Stellenbosch) and two of the students were also present at Observation V.3 (the MPA Forum in Langebaan). Details of these interviews and observations can be found in Section 4.5 on data collection, later in this chapter. Unfortunately no official skills strategy document could be sourced for ORI/SAAMBR but eight examples of peer-reviewed papers by ORI scientists are listed below, which provided insight into their scientific practice,

[6] uShaka Marine World is comprised of an aquarium and an education centre and, along with ORI, make up SAAMBR (the South African Association of Marine Biodiversity Research). See more in Chapter One, Section 1.7.

interests and level of competence and focus in the professional field, and also provided insight into their relationality with the materiality of the marine world and the socio-materiality of the profession.

Paper Title	**Year of publication**
An assessment of integrated coastal management governance and implementation using the DPSIR[7] framework: KwaZulu-Natal, South Africa	2017
Changes in recreational shore anglers' attitudes towards, and awareness of, linefish management along the KwaZulu-Natal coast, South Africa	2017
Local habitat drivers of macrobenthos in the northern, central and southern KwaZulu-Natal Bight, South Africa	2016
Movement patterns of surf-zone fish species in a subtropical marine protected area on the east coast of South Africa	2015
Baseline assessment of high-latitude coral reef fish communities in southern Africa	2012
Macrobenthic invertebrate responses to prolonged drought in South Africa's largest estuarine lake complex	2010
An update on initiatives to reduce prawn trawl bycatch in the Western Indian Ocean	2008
Comparison of the fillet yield, protein content and amino acid profile of *Clarias gariepinus* and the *Clarias gariepinus X Heterobranchus longifilis* hybrid	2000

Case study 2: SAIAB – South African Institute for Aquatic Biodiversity

Like at ORI, I approached principal scientists at SAIAB who were involved in marine or estuarine research as well the managing director for interviews about their careers and opinions on up-skilling in the marine sector. During my contextual profiling phase I also spoke to SAIAB's research support officer and the communications and governance manager. The operations manager provided me with valuable HR documents**,** two of which were included as documents to be analysed as data. The managing director gave a presentation at Observation V.1 (the Marine and Coastal Educators Network conference) and many of the SAIAB scientists would have attended and presented research at the Southern African Marine Science Symposium (Observation V.2). The SAIAB staff were also well qualified in terms of academic degrees and the scientists I spoke to all had doctorates, as well as many years of experience in the marine and/or estuarine sector. As was the case with ORI, the scientists at

[7] Drivers-Pressures-State-Impact-Response (DPSIR) framework

SAIAB generally have four or more post-graduates, or post-doctoral fellows working under them and these students/researchers were, in most cases, registered at Rhodes University which has close ties with SAIAB.

Research at SAIAB includes freshwater environments but whether freshwater, estuarine or marine, researchers ultimately consider how biodiversity at the molecular and organism level links to the environment and conservation biology. The website explains it as follows:

- Conservation Biology & Ecology: Focuses on understanding the processes underpinning aquatic biodiversity in order to inform the conservation of those resources.
- Molecular Biology & Systematics: Focuses on the exploration and description of southern African aquatic biodiversity from a molecular to a community level.

The examples of peer-reviewed papers presented below, give an idea of what some of the marine and estuarine scientists at SAIAB are, or have been, working on in their respective fields. Of course the scientific papers and reports published by SAIAB staff are far more prolific than what is shown here but these were selected to show the diversity of topics covered and the specificity of the marine, coastal and estuarine work that takes place within this institute.

Paper Title	**Year of publication**
Fish on the move: Connectivity of an estuary-dependent fishery species evaluated using a large-scale acoustic telemetry array	2018
Space use by *Rhabdosargus holubi* in a southern African estuary, with emphasis on fish movements and ecosystem connectivity	2017
A brief overview of the ACEP[8] project: Ecosystem Processes in the KwaZulu-Natal Bight	2016
Biomass and productivity of fishes in estuaries: A South African case study	2016
Genetic structure and consequences of stock exploitation of *Chrysoblephus puniceus,* a commercially important sparid in the South West Indian Ocean	2015
Use of remote underwater video to record littoral habitat use by fish within a temporarily closed South African estuary	2010
The role of the Tsitsikamma National Park in the management of four shore-angling fish along the south-eastern Cape coast of South Africa	2002
Do shallow-water habitats function as refugia for juvenile fishes?	2000

[8] The African Coelacanth Ecosystem Programme

Case study 3: DEA – Department of Environmental Affairs: Oceans and Coasts

The national Department of Environmental Affairs plays a key role in management and conservation issues in South Africa and their Oceans and Coasts branch collaborates with all the other organisations that form cases in this study. The head office of Oceans and Coasts is in Cape Town and I held a group discussion with four staff members, one of which was a scientist and the other three were managers. Due to time constraints on their side, it was only possible to have a group discussion around up-skilling in the marine sector and unfortunately one-on-one interviews were not possible during the week I was in Cape Town. A number of documents were sourced for, and from DEA, although some were more general and not necessarily directly related to skills strategies or human capital development (HCD). The documents listed in Table 4.2 are for DEA, and not specifically Oceans and Coasts, but refer to the branch in a number of places. I had previously met the one manager, who was part of the group discussion, at Observation V.3 (the MPA Forum in Langebaan).

The documents sourced for DEA were mostly reports or reviews and it seems that peer-reviewed papers are not as much of a priority for the DEA staff as they are for scientists at ORI or SAIAB, for example. However, the Oceans and Coasts branch support and facilitate a great deal of scientific research and a clear example is the country's latest research and supply vessel, the SA Agulhas II. This vessel's primary purpose is for research in Antarctica and the Southern Ocean Islands and the Oceans and Coasts website explains how many post-graduate studies have been conducted on Marion Island and that South Africa has been operating a weather station on Gough Island since 1956. Much of this research and data has fed into projects by SANBI, or other organisations which are concerned with biodiversity, climate change and island/Antarctic ecology. The peer-reviewed papers below were co-authored by the scientist that formed part of the group discussion with DEA – Oceans and Coasts.

Paper Title	**Year of publication**
Marine fisheries monitoring programmes in South Africa	2009
Food, transport and anchovy recruitment in the southern Benguela upwelling system of South Africa	1998

Case study 4: SANBI – South African National Biodiversity Institute

In Chapter One I mentioned that the SANBI Marine Programme is run by a small but dedicated team and I felt it necessary to include them in the study due to their influential position as the organisation that is mandated to monitor and report (for, and to, DEA) on the state of biodiversity in South Africa, and this includes marine biodiversity. The aforementioned team consisted of two permanent staff and two contract staff at the time of my visit to the Cape Town offices. I interviewed one of the permanent staff, the Marine Projects manager, who had also attended the Southern African Marine Science Symposium (Observation V.2). Understandably, the Marine Programme manager was extremely busy and was thus unavailable for an interview; however, she had presented research at both Observations V.2 and V.3 (the Southern African Marine Science Symposium and the MPA Forum). The document that was sourced for SANBI was not specifically related to HCD strategies but was a report on the MPAs of South Africa that mentions management and capacity building. Nevertheless, if one considers the fact that SANBI produced the Human Capital Development Strategy for the Biodiversity Sector, on which this research is largely based, it could be taken as the fundamental document analysed for this research.

SANBI's marine programme operates at a national level but is also involved in regional and international initiatives. Their focus, however, is South Africa's marine territory which includes the Exclusive Economic zone of the mainland (as seen in Figure 1.2) and the Prince Edwards Islands. The marine programme heads up a number of multi-partner projects which are listed below.

- Deep Seacrets
- Linefish IUCN Regional Red Listing
- National Biodiversity Assessment 2018
- SeaKeys: Unlocking Foundational Biodiversity Information
- Fish Atlas and FishForLife
- Marine Alien and Invasive Species
- Phakisa: Unlocking the Oceans Economy

Three peer-reviewed papers and one book are presented below as examples of the research being done by SANBI's marine programme. The project manager and/or programme manager authored or co-authored these and other research papers, as well as working with DEA-Oceans and Coasts on many initiatives and projects.

Paper Title	Year of publication
Systematic marine biodiversity plan for the West Coast of South Africa	2013
The effect of frequency and nature of pedestrian approaches on the behaviour of wandering albatrosses at sub-Antarctic Marion Island	2009
BOOK: *Guidelines for offshore marine protected areas in South Africa*	2008
Biogeographic patterns in rocky intertidal communities in KwaZulu-Natal, South Africa	2005

Case study 5: CapeNature – biodiversity conservation: Western Cape

The programme manager for MPAs, Islands and Estuaries at CapeNature is based in Betty's Bay, in the Western Cape, and I conducted an interview with this manager after having initially spoken to him about my research at the SAMSS conference (Observation V.2). The programme manager also put me in touch with the HR Manager who provided me with the HCD strategy for CapeNature. It was also important that I include a Western Cape conservation agency so as to gain 'on-the-ground' insights into the marine issues in this province. The Coastal Programme at CapeNature focuses on MPAs, Islands and Estuaries and the programme manager motivated for this programme to be formally recognised by CapeNature in 2009 while he was working on contract, as the coordinator of the CAPE Estuaries Programme. Prior to this, CapeNature ran the CapeNature Marine Protected Areas, Islands and Estuaries Forum which dealt with conservation and management issues of these priority areas. Through supervising students and co-ordinating research, the programme manager has remained in touch with the scientific field and he is involved in a number of monitoring projects. An example of marine research he has supervised is a project looking at abalone densities in Betty's Bay MPA and more recently, he has contributed to a book on estuaries. Other work of his is listed below.

Paper Title	Year of publication
BOOK: Estuary management in South Africa – An overview of the challenges and progress made to date. In *Estuaries: A Lifeline of Ecosystem Services in the Western Indian Ocean*	2016
Aspects of the biology and ecology of the Orange-Vaal largemouth and smallmouth yellowfish in the Vaal River	2011
Status of the Orange-Vaal largemouth yellowfish, *Labeobarbus kimberleyensis* (Gilchrist & Thompson, 1913)	2007

Case study 6: WWF – World Wide Fund for Nature - Marine programme: South Africa

WWF run a multitude of environmental programmes, of which 'marine' is one. I spoke with the senior manager of the programme who oversees a number of projects and sub-programmes such as consumer awareness projects or the small scale fisheries project. WWF-SA also play an integral part in organising the annual MPA Forum which is Observation V.3 in my research and the senior manager of WWF-SA's marine programme was at this MPA Forum. During my research period, a dedicated MPA Forum coordinator was appointed by the marine programme and I was in touch with this person by email. One document is included in the analysis that relates to workplace skills plans and the peer-reviewed papers listed below show the scope of work published by the marine programme.

Paper Title	**Year of publication**
Fisheries certification in the developing world: Locks and keys or square pegs in round holes?	2016
Fish species substitution and misnaming in South Africa: An economic, safety and sustainability conundrum revisited	2015
State of Management of South Africa's Marine Protected Areas	2014
Desperate times for SA's traditional linefishery	2008

Case study 7: SANParks – South African National Parks

When introducing the cases in Chapter One, I described the role of a Marine Coordinator who works for SANParks and by formally registering my doctoral research with SANParks, I could include this Marine Coordinator in my research. Based in Port Elizabeth and associated with the Nelson Mandela University, this marine scientist is involved in management decisions and planning and she was instrumental in this case study. This was similar for the senior section ranger I interviewed, who was based at the Woody Cape section of the Addo Elephant National Park. This park includes a number of islands in Algoa Bay, as well as the Bird Island Group MPA. It is also important to note that the Woody Cape section of this park is adjacent to the proposed Addo Elephant MPA. One document was sourced for SANParks and it was the current strategic plan which talks of capacity building and required skills in the various sections. The interviewees for this case were not directly involved in any of the observations but knew of the various conferences and the annual MPA Forums. The marine scientist mentioned above has authored or co-authored the following papers:

Paper Title	Year of publication
Assessing the suitability of commercial fisheries data for local-scale marine spatial planning in South Africa	2014
Developing a policy and operational protocol for the formation of new commercial fisheries in South Africa	2007
Temperature effects on the embryonic development and hatching success of the squid *Loligo vulgaris reynaudii*	2002

Case study 8: Ezemvelo KZN Wildlife – biodiversity conservation: KwaZulu-Natal

At Ezemvelo KZN Wildlife, I was unable to meet with any of the managers involved in the reserves or MPAs but had a meeting with an HR staff member and later interviewed a knowledgeable scientist who works for Scientific Services. The head of the Scientific Services section at the time of data collection was also a senior marine scientist and would have been the ideal candidate to interview; however, she was also very busy and often travelling. Therefore, I spoke to the marine GIS analyst who works in the Biodiversity Spatial Planning and Information section (based at the Ezemvelo KZN Wildlife headquarters in Pietermaritzburg, KwaZulu-Natal). Both these scientists would have attended and presented at the Southern African Marine Science Symposium (Observation V.2) and I obtained one relevant piece of documentation that was included in the analysis.

The papers listed below give an idea of the type of research being conducted by Ezemvelo KZN Wildlife and various collaborating organisations in the field of marine conservation and research. From the paper titles, it can be seen that the publications range from matters of national concern to more specific, provincial, challenges and topics.

Paper Title	Year of publication
Phakisa Initiative: Fast-tracking establishment of an effective and representative network of Marine Protected Areas for South Africa	2014
Coastal and marine biodiversity plan for KwaZulu-Natal, South Africa	2012
Marine Systematic Conservation Assessment and Plan for KwaZulu-Natal – Spatial Priorities for Conservation of Marine and Coastal Biodiversity in KwaZulu-Natal	2011
Evaluating conditions for successful co-management of subsistence fisheries in KwaZulu-Natal, South Africa	2005

Case study 9: WESSA – The Wildlife and Environment Society of South Africa

As mentioned in Chapter One, WESSA run two marine-focused initiatives, these being the Blue Flag Project and the Blue Flag Programme. Both these fall within the EcoTourism Unit of WESSA and for my research I conducted a telephonic interview with the general manager of this unit. The unit also runs the internationally recognised Eco-Schools, Young Reporters for the Environment (YRE) and Learning about Forests (LEAF), thus the manager has a range of skills and knowledge. He is skilled in:

- Sustainable tourism
- Environmental Impact Assessments
- Environmental awareness
- Geographic Information Science
- Community based natural resource management

With regard to the Blue Flag Programme, the manager described this initiative as "an excellent example of what is achievable when government, both local and national, partner with civil society" and he continued that not only does the programme "encourage adherence to very high, international standards for beaches, boats and marinas but it has also created an excellent platform from which to develop young and enthusiastic, sustainable tourism ambassadors". Although no official skills strategy documents or peer-reviewed papers could be sourced for WESSA's EcoTourism Unit, there are published studies about beachgoers' awareness and preferences in relation to the Blue Flag certification, in South Africa and internationally. The implications for tourism, the environment and the socio-economic effects are also considered topics of interest when evaluations have been done on these initiatives. The general manager of the EcoTourism Unit was not involved in any of the observations that took place for this research.

4.5 Methods: Data generation

The data generation phase of this study primarily involved in-depth, semi-structured interviews; however, prior to approaching specific individuals at the chosen organisations, there was a period of contextual profiling. This process of contextual profiling contributed to the decisions about which organisations were appropriate and allowed for a more focused approach to the overall study. In addition to the semi-structured interviews, documents and peer-reviewed published papers were analysed and these were used as supplementary data generation tools along with specific observations of events that took place in and around the marine sector. Initially, I also designed and sent out a questionnaire (Appendix C), as a

broad-scale data generation tool (as it contained general questions regarding up-skilling opportunities and practices at the organisations) but due to a lack of responses, I adapted this approach and incorporated the questions into the semi-structured interviews.

Yin (2014) noted that careful selection of data-rich cases is an important aspect of case study research and, as has been discussed in relation to critical realism, this richness of the cases can lead to the discovery of the generative mechanisms that constitute valuable and meaningful findings in social science research (Danermark et al. 2002). It is for this reason that the contextual profiling process is of such importance in post-graduate research such as this and before going into more details about the data generation tools, I explain how this contextual profiling was carried out in the following section.

4.5.1 Contextual profiling

Contextual profiling is a process through which information is gathered about the relevant field of research and it informs the direction and scope of the study as well as contributes to the formation of the research questions that are put forward at the proposal stage of the research. Thus, it was while developing the proposal for this doctoral research that the contextual profiling began and it continued for some time after the acceptance of the proposal. It led to an informed and meaningful research proposal and laid the foundation on which the data gathering phase could be carried out. Although there have been some changes in the sub-questions, the main research question that was developed at the time of contextual profiling has remained very close to what was originally put forward.

As part of the contextual profiling process, I had many discussions with individuals who were familiar with the marine sector and the skills that were involved in the various careers I might be interested in. I always made notes of names and organisations that might be useful to my research and in some cases, I was approached by interested individuals (such as at the conference that makes up Observation V.2, where a manager came to me after my presentation at an education and outreach session and said he would like to talk further about my research). Through multiple discussions and with the observations that formed part of my data, I arrived at 10 organisations or research institutes, which I then profiled to attain a broader understanding of the mandates and missions of these organisations, as well as to start

assessing the possible up-skilling opportunities that might be available to professionals in the marine sector. Two examples of important discussions I had are:

- a discussion with Lawrence Sisitka who helped in developing the WIO-COMPAS certification programme for MPA employees and has extensive experience in capacity building for natural resource management (at both the professional level and rural community level) to talk about skills, certification, and the contacts he had in the relevant organisations,
- an initial meeting with SAIAB's research support officer as well as the communications and governance manager, who provided me with SAIAB's official HR Policy manual and training information; they also suggested which scientists I could approach for interviews.

Of the 10 organisations identified, nine became in-depth case studies for this research and the reasons for this are discussed in the strengths and limitations section at the end of this chapter.

4.5.2 Semi-structured interviews

The principal method of data generation was in-depth, semi-structured interviews which aimed at exploring the up-skilling opportunities and practices encountered, or taken up, by the participants at the marine and coastal organisations involved. For critical realism, people's accounts give insight into the domain of the real (Maxwell 2012) and by giving their views and thoughts on certain events or experiences, they can hint at the underlying mechanisms that this research hopes to uncover. The questions and discussion points of the interviews were focussed on the experiences of the scientists or managers and what they had found valuable or where they had learnt the most. I also enquired about influential people in their careers and defining moments in their journeys as marine/coastal scientists or managers. The relevance of formal up-skilling opportunities was another talking point as well as the skills or knowledge that was required for their roles and those of their colleagues in similar positions.

As Maxwell (2008) pointed out, the real interest in most qualitative studies is how participants make sense of what has happened and how this perspective shapes their actions, not necessarily the actual events that took place. It is for this reason that the interviews were not the sole method of data generation and by integrating information from other sources and comparing the findings, it was possible to get to the 'best' truth of the situation. Although the interviews were intensive, the semi-structured approach allowed for details that I had not

previously considered arising and on occasion these were valuable contributions to the findings and gave me a better understanding of the complex nature of training, skills development and capacity building in the marine sector. The interviews in this study provided in-depth insights into the participants' work lives and what they found to be important in terms of their learning (both formal and informal) in, through and for the workplace.

Table 4.1: Breakdown of participants that were interviewed at the nine organisations

Organisation	Interviews		Details
	Scientists	Managers	
ORI	4	0	Including the director
SAIAB	3	0	Including the director
Dept. of Env. Affairs (Oceans and Coasts)	1	3	Group discussion
SANBI	0	1	Programme manager/scientist
CapeNature	0	1	Programme manager
WWF	0	1	Programme manager/scientist
SANParks	1	1	Region: Addo Elephant National Park
Ezemvelo KZN Wildlife	1	0	Scientist/GIS analyst
WESSA	0	1	Programme manager

4.5.3 Documents and peer-reviewed papers

At the outset of this study I started by reviewing the documents and information that were available online and this informed the direction of interview questions and what might be relevant to the various organisations. Through analysing the mandates of the organisations and their mission statements, I could deliberate over the data generated from the interviews with this background knowledge of the formal mandates of the organisations. During or after the interviews I also requested the annual training or skills plans which were important documents to consider and analyse what is formally required or recommended. These

documents could then be compared to what is actualised in the reality of the professionals' day-to-day working lives. The documents gathered also formed critical reference points for some of the topics that were brought up in the interviews. The documents were not always directly concerned with training or skills development but included documents about management more generally, or departmental reviews (see Table 4.2). In some cases, the HR departments could not provide me with any formal skills plan or policy document and this limited the data for these organisations but this was in itself an important point that was noted.

Peer-reviewed papers written and published by the participants since the year 2000 (in one case, a paper from 1998) were also considered a data source and these papers provided valuable insights into the research concerns of the various organisations. By considering the topics that the scientists (or managers) were writing about and sharing in their relevant fields, I could integrate the issues brought up in the semi-structured interviews with the 'materiality' of the research they were doing or associated with. In some cases I included papers published by the colleagues of the participants in order to give a broader picture of the research being conducted. The titles and years of publication of these papers have already been presented in Section 4.4.1 under each organisation and when describing the research participants. Where available, or when permission was given, I also considered the CV's of the participants but for reasons of anonymity, these are not made available anywhere in the dissertation. In addition, I made note of less formal documents such as emailed or online brochures (see Appendix D for an example), newsletters or course flyers that were relevant to up-skilling opportunities in the marine sector.

Table 4.2: Details of documents and relevant websites used in this research

*HCD = Human capital development

Organisation	**Document**	**Notes***
ORI	Website: https://www.saambr.org.za/oceanographic-research-institute-ori-position-statement/	
SAIAB	a. Consolidated Human resources Policies & Procedures Manual, 2013 b. Training information 2012-2016 Website: http://www.saiab.ac.za/	a. Analysed in full b. Examples extracted for inclusion in findings
DEA (Oceans and Coasts)	a. Strategic Plan 2015/16 – 2019/20 (DEA 2015) b. Annual Performance Plan 2017/18 (DEA 2017) c. Marine and coastal management (In: A review of the Department of Environmental Affairs and Tourism: 1994 – 2009) d. National Protected Area Expansion Strategy for South Africa 2008 (published: 2010) Website: https://www.environment.gov.za/branches/oceans_coast	a. Analysed in full b. Examples extracted for inclusion in findings c. & d. Reference to building capacity noted
SANBI	a. Offshore Marine Protected Area Project: Final Summary Report 2011 Website: http://www.sanbi.org/	a. Document not directly related to HCD strategies, but SANBI assisted in developing the Biodiversity HCD Strategy on which this research is based)
CapeNature	a. CapeNature HCD Strategy (2013-2015) Website: http://www.capenature.co.za/	a. Analysed in full
WWF	a. A Guide to improved Workplace Skills Planning (DRAFT: HRD Toolkit) Website: http://www.wwf.org.za/our_work/oceans/	a. Examples extracted for inclusion in findings (Unclear if developed for use internally or as a course to be delivered externally)
SANParks	a. South African National Parks Strategic Plan for fiscal years: 2014/15 – 2018/19 Website: https://www.sanparks.org/	a. Examples extracted for inclusion in findings
Ezemvelo KZN Wildlife	Five Year Strategic Plan and Performance Plan (2009 – 2014) Website: http://www.kznwildlife.com/	a. Analysed in full
WESSA	Website: http://wessa.org.za	

4.5.4 Observations

Partially as part of the contextual profiling process for the study, but also contributing to the data generation phase, observations of various events were made and these were valuable opportunities to inform my research and give a clearer picture of the marine sector as a whole. The observations were also important for reflexivity purposes (see Section 4.7.3). The thorough notes that were made from the observation events furthered my understanding of the learning that takes place in certain situations, whether it was formal or informal learning.

Although the original intention was to conduct observations of up-skilling opportunities or practices related to, or based at the organisations and institutes that formed the case studies for this research, it soon became clear that this would not be possible. The reasons for this were sometimes logistical but often the opportunities were simply not there. Therefore, in reality, the observations were of events, workshops or conferences that meant a coming together of multiple organisations or people involved in the marine sector. In many ways these were critical opportunities to observe the relationships or 'relatings' (of practice architectures) between certain people affiliated with certain marine or coastal organisations and more often than not, it was at these events where specific issues were raised and discussed, and without these discussions I would not have been aware of the issue. On occasion the observations would introduce an element of confusion in the form of making me question *who* I should be including as cases, such as university departments, municipal or provincial branches involved in MPA or coastal management and even aquariums. However, in the interest of keeping the research focused and of a reasonable size, I decided against including these as cases. Observations are outlined in the table below.

Table 4.3: List of observations

Observation	**Date**
V.1. Marine and coastal educators network (MCEN) conference (Port Elizabeth)	5-10 January 2014
V.2. Southern African Marine Science Symposium (SAMSS) (Stellenbosch)	15-18 July 2014
V.3. Marine Protected Areas Forum (Langebaan MPA)	15-19 February 2015

4.6 Methods: Data analysis

In the previous section, the data generation tools were discussed but here a detailed account of how the data was organised, processed and analysed will be presented. The initial procedures which included index coding of the participants and thematic analysis of the interview transcripts and documents are described. In addition, the way in which the themes and sub-themes were developed, using a combination of abduction and induction, will be discussed. I then go on to explain how the retroductive analytical work was done and how transfactual argumentation led to the generative mechanisms that are described in Chapter Seven.

Before data analysis could begin, index coding of the participants was necessary. This was done to ensure all scientists and managers remained anonymous and their real names did not appear in the thesis, as was outlined in the consent forms. The ethical reasons for this are explained later in this chapter. Codes were assigned by choosing letters or symbols to represent organisations and then a number to represent the participant. The rationale behind choosing letters with distinct features such as the C with a cedilla, or the E with an acute accent was to create a unique and easily identifiable code for each participant. In some cases, the letter chosen is taken from the acronym, such as the 'R' from ORI, while in others, the letters allow for smoother reading when quoting or referring to the participants in the data chapters. To distinguish between managers and scientists I started with the relevant word, for example ScientistR1 or ManagerH1. Table 4.4 below, provides a breakdown of the index codes used in each case study. The numbers were assigned in the order the interviews were conducted, i.e. chronologically. If the participant was a programme manager but also a scientist I referred to them as a manager.

Table 4.4: Index coding

Organisation	Code for organisation	Participants
ORI	R	ScientistR1
		ScientistR2
		ScientistR3
		ScientistR4
SAIAB	Ä	ScientistÄ1
		ScientistÄ2
		ScientistÄ3
DEA (Oceans and Coasts)	G	ScientistG1
		ManagerG1
		ManagerG2
		ManagerG3
SANBI	É	ManagerÉ1
CapeNature	B	ManagerB1
WWF	H	ManagerH1
SANParks	Ç	ScientistÇ1
		ManagerÇ1
Ezemvelo KZN Wildlife	W	ScientistW1
WESSA	N	ManagerN1

The practicalities of data analysis include storage and handling of the raw data and in this research, voice recorders were used during the semi-structured interviews and these recordings were transcribed verbatim into Microsoft Word documents. All documents were arranged into folders according to each case study and the relevant documents were included in these folders. All raw data was stored on my personal computer and backed up onto a hard-drive as well as my Google Drive. For analysis and reference purposes, the transcribed data and documents were also printed and kept as hard copies.

4.6.1 Semi-structured interview and document analysis

The method of transcribing word-for-word is commonly used for studies that include interviews, as simply taking notes on what the researcher felt was significant, is often

inadequate when collecting 'rich' data that is detailed and varied enough to gain a deeper understanding of the case (Maxwell 2008). While transcribing the interviews, I also became more familiar with the narratives and some basic patterns began to emerge. These patterns raised initial questions in my mind around what might become relevant, or important, later on in the analysis process. The transcripts and documents were then coded by arranging the data under themes which were derived from the relevant theories (see example of the Microsoft Excel spreadsheet format in Appendix E). In his chapter on designing qualitative studies, Maxwell (2008) referred to coding data into different categories and noted that the goal of coding in qualitative research is not to produce counts of things, but rather to "fracture" the data (a term used by Strauss 1987, p.29) and "rearrange it into categories that facilitate comparison between things in the same category and between categories" (Maxwell 2008, p.237). This method of organising and re-arranging the data into themes draws on induction as a mode of inference, where the researcher does not move beyond the empirical level but similarities are identified. In addition, using themes or categories derived from pre-existing theory is associated with abductive reasoning, which involves interpreting and re-contextualising individual phenomena within a conceptual framework or a set of ideas (Danermark et al. 2002). The development of the sub-themes that were used in Chapter Five and the presentation of the findings under the specific sub-headings in Chapter Six, involved a combination of induction and abduction; this allowed for logical presentation of the data in these chapters. More details on how the themes and sub-themes of this research were developed can be found in the following sub-section.

Deduction, induction, abduction and retroduction were first introduced in Chapter Three (Section 3.2.2: Retroduction) and earlier in this chapter, in Section 4.2 (Implications of critical realism for research design and analysis), retroduction, abduction and deduction were described as modes of inference that are central to the procedure of generalisation in critical realist research. This issue of making generalisations is re-visited in the following section on validity, but what is important here is the use of retroduction for the purpose of identifying causal mechanisms. Following the thematic analysis of my data, the retroductive analytical work began and while keeping in mind the research questions of this study, I began to ask questions around the underlying mechanisms and enduring powers or properties that might be at work in this research into up-skilling opportunities and practices in the marine sector of South Africa. An integral part of retroductive analysis is transfactual argumentation (or

transcendental argumentation, as it is called in philosophy) and counterfactual thinking (Danermark et al. 2002). By using these thought operations, we seek to clarify the basic prerequisites or conditions for social relationships, people's actions, reasoning and knowledge (ibid.).

Transfactual argumentation means going beyond the empirical and entails constructing explanatory accounts of the phenomena that is being studied. Danermark et al. (2002) explained that "critical realism regards the objects of social science as (mainly) relational" (p.97), therefore retroduction is concerned with attaining knowledge about what internal relations make the phenomenon, referred to as X, what it is. In the case of this research, I considered the findings that were emerging in the themes and sub-themes, from the semi-structured interviews and documents, and asked the following transfactual questions:

- What makes X possible?
- Could I imagine this scenario (X) without……? And could X become something different if …… was not included?
- What is the ultimate precondition for……?
- Could such mechanisms actualise in different conditions, times or places?
- What powers or properties come through as enduring?

Thus, using these questions to consider social structures and relations, I was able to construct the explanatory accounts that are presented as mechanisms in Chapter Seven. The counterfactual thinking that took place also meant that I could understand the phenomenon of up-skilling and professional practices in relation to what it is not. Danermark et al. (2002) described this concept further by saying:

> In our understanding of the world, presence and absence are constitutive of one another. Correspondingly, we can only discern the necessary, constitutive properties of something by relating these properties to what is not constitutive (but rather an accidental circumstance). To understand the specific and constitutive for X – a social identity, a social ritual, a way of life, an institution, a linguistic genre, etc. – we must also have some idea of what X is not. (p.101)

By coming to understand what up-skilling is (and is not) and how this influences learning in workplaces, I could draw conclusions that were meaningful to the biodiversity sector and had broader relevance for workplace learning research.

4.6.2 Developing the analytical categories/themes

One of my primary analytical tools was the framework of practice architectures from practice theory and thus, I took the three orders of the 'sayings', 'doings' and 'relatings' as initial themes. These orders have corresponding dimensions which Kemmis and Heikkinen (2011) described as:

> … existing *cultural-discursive arrangements* like the languages and specialist discourses that describe and justify the sayings that occur in particular practices; existing *material-economic arrangements* that make possible the doings – the activities – that compose the practice; and existing *social-political arrangements* that make possible the relatings that compose the practice. (p.3)

Considering my other theoretical lenses, along with the sensitising concepts used in this research, I identified five additional themes, namely: socio-materialism, agency, learning, formal and informal opportunities/learning. It soon became clear that the dimensions described by Kemmis and Heikkinen (2011) above, overlapped with the other themes to a certain degree, but when this occurred during the analytical phase of categorising the data, I made a note of the overlap and was careful to never consider a theme/category in isolation. A diagrammatic representation of how the themes were developed from the various theoretical lenses and sensitising concepts can be found in Appendix F along with a second diagram showing how the theories are connected (or overlap) in Appendix G.

The sayings, doings and relatings that emerged from analysing the semi-structured interviews and documents are presented in Chapter Five. The sub-headings used in Chapter Five group the sayings and doings, and then deal with relatings under a separate sub-heading; however, the findings in each case study were also arranged into sub-themes under each sub-heading. These sub-themes were once again developed through a process of induction and abduction. As will become clear in Chapter Five, the sub-themes were not common to all cases and although similarities across cases could be found, the sub-themes were not intended to be set categories but rather were emergent from the findings. Furthermore, certain sub-themes did not necessarily fit neatly under the broader themes (for example: 'Communication' also appears under sayings/doings in case study one, ORI). Thus, Table 4.5 does not list all the sub-themes but provides a snap-shot of the sub-themes that can be found in Chapter Five.

Table 4.5: The sayings, doings and relatings as themes and examples of the sub-themes found in Chapter Five

SAYINGS	DOINGS	RELATINGS
Available opportunities		*Networking and conferences*
Transformation in science/research		*Communication*
Work experience vs qualifications		*Power in the social space and politics*
Management skills		*Skills and equity*
Skills diversity & biodiversity	*Publishing*	*Personal inspiration and motivation*
Time and risk	*Operation Phakisa*	*Organisational buy-in*
MPAs	*Specific training*	*Collaboration and partnerships*

In Chapter Six, the remaining analytical themes are addressed, i.e. socio-materialism, agency, learning, formal and informal opportunities/learning. These are arranged in such a way that agency and learning are common to all sub-headings but are considered in relation to the socio-material realities (socio-materialism), the formal up-skilling opportunities/programmes and the informal opportunities/experiences. In Figure 4.1, it should be noted that the double headed arrows represent an association with agency, while the solid lines leading to 'learning' show that learning was considered an integral part of each of these themes.

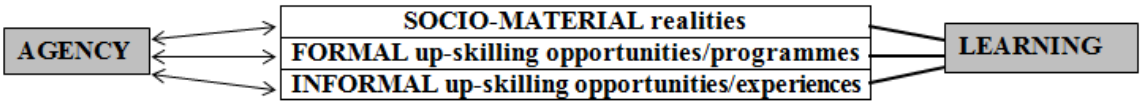


Figure 4.1: Sub-headings in Chapter Six with relevant themes and how they are connected

Chapter Seven does not rely on thematic analysis but summarises the findings outlined under the various themes and sub-themes of Chapters Five and Six. Its focus is primarily on the phenomenon that is up-skilling and the mechanisms, or transfactual conditions that are apparent in this research.

4.6.3 Analysis of observations

For the formal observations of this research, I followed the advice of Maxwell (2008) who stated that "rich data are the product of detailed, descriptive note-taking … of the specific, concrete events that you observe" (p.53). The observations were conducted in order to gain a better understanding of the site-context of this research into up-skilling opportunities and practices. That is, the observations were a key aspect of the field-based reflexivity in this study. This is explained in more detail later in this chapter, under 'reflexivity and researchers positioning' (Section 4.7.3). During this process of descriptive note-taking, the social interactions that took place between the relevant organisations were of particular interest and as the study progressed, this aspect of relationality came through as one that was essential for the marine professionals and their practice. I was careful to also note the relationships between government departments and officials, universities, independent consultants and various other stakeholders.

In addition, and while keeping in mind the themes identified from the theoretical framework of this research, I made specific notes on the role of the material in the marine sector and the agency exercised by the individuals within and around their work. Retroductive analysis was crucial for the observations in this research and the transfactual questions that were outlined earlier in this chapter were once again used to guide my thought processes, while drawing conclusions from the observations.

4.7 Validity, ethical considerations and reflexivity

This section explores three crucial aspects of qualitative research and explains how the new knowledge being created by this study contributes to the broader field in a rigourous and credible way. Before examining the notion of validity in detail, it must be noted that validity is often associated with generalisations and in some cases the term "external validity" is used to describe the generalisability of an account (Maxwell 2012). Although generalisation has been discussed elsewhere (in Chapter Three in relation to 'Retroduction' and earlier in this chapter when discussing generalising from case studies), here it is considered in conjunction with the research design of this study. Qualitative studies such as this one are usually not designed to allow systematic generalisations to some wider populations but Maxwell (2005) has distinguished between *internal* generalisability, where generalisations are made within the setting, group, or institution studied to persons, events or settings that were not directly

observed or interviewed, and *external* generalisability where generalisations are made to other settings, groups or institutions. For qualitative researchers, internal generalisability is the more valuable of the two and when making inferences, researchers must assess the validity of their accounts with this kind of generalisability in mind. Drawing inferences from interviews is especially problematic in this way, as an account "may be descriptively, interpretively and theoretically valid as an account of the person's actions and perspectives in that interview, but may miss other aspects of the person's perspectives that were not expressed in the interview" (Maxwell 2012, p.143). However, it is important to remember that in critical realist studies, the goal is to discover the underlying mechanisms at play in the 'phenomena of interest' and this aligns with the objectives of most qualitative studies which are to understand the processes, meanings, and local contextual influences for the specific settings or individuals studied (Maxwell 2012). In this study, the phenomenon of interest is the learning that occurs in and around the up-skilling opportunities and professional practices in the marine sector of South Africa.

The sub-sections that follow take an in-depth look at the various aspects of validity and what was done in this particular study to ensure validity and quality, as well as the ethical considerations that are necessary in qualitative research. With the hope of achieving all-round integrity of the research I endeavoured to act in a professional manner at all times during this research. Also, as Schutt (2011) pointed out, confidence in the conclusions drawn from social science research comes from an honest account of how the researcher interacts with participants, which I have attempted to do throughout this thesis. Part of giving an honest account, includes acknowledging the strengths and limitations of the research which is done in the final section of this chapter.

4.7.1 Validity and evidence

> If there is a reality that our theories and conclusions enable us to better understand and deal with, then the nature of this reality is critical for assessing the sorts of understandings that we can attain, the conclusions that embody these understandings, and the evidence we use to reach these. (Maxwell 2012, p.127)

The above quote refers to the "nature of reality" which, as was discussed in Chapter Three, critical realists consider to be something that is beyond the constructions and theories we create but rather, it pertains to the real world which is independent of our knowledge of it

(Danermark et al. 2002). Quantitative researchers tend to avoid any reference to things that must be inferred but in contrast, qualitative researchers use various modes of inference to reach conclusions about the phenomena that they study. This has resulted in the term 'validity' being a contested one due to the fact that some researchers find it to be too closely tied to positivist ideas of a singular, objectively knowable reality (Maxwell 2012). The excerpt from Maxwell also talks of reaching a better understanding of reality which resonates with the goal of this research which is to understand the (reality of) up-skilling opportunities and practices in the marine sector and to discover the deeper mechanisms that have causal powers in this social situation. Thus, the aspects of validity, evidence and understanding need to be carefully considered in order to achieve this goal.

At the outset of any qualitative study, a researcher needs to ask themselves a number of questions about validity and quality in their research. They need to consider how to deal with the validity threats that their findings might face, such as conclusions being wrong or there being alternative interpretations of the data that is collected (Maxwell 2008). Yin (2009) says that a "research design that has anticipated these questions has begun to deal with the overall problem of making inferences and therefore the specific problem of internal validity" (p.43). Anticipating these questions is one way of addressing validity in qualitative research and another related way is to consider the different types of validity as proposed by Maxwell (2012). These are descriptive validity, interpretive validity and theoretical validity.

Descriptive validity is concerned with the factual accuracy of an account and the researcher must be sure that they are not making up or distorting the things they saw and heard. The most common discussion around this type of validity involves the recording of field-notes and interviews. These practical aspects of accurate recording were dealt with earlier in this chapter under the section on data analysis but as Maxwell (2012) pointed out, this type of validity "can refer to issues of omission as well of commission; no account can include everything" (p.137). It is for this reason that I transcribed the semi-structured interviews verbatim and when re-describing the data in Chapters Five and Six I relied on the participants' own words as much as possible. Throughout the process of data analysis I considered what might be 'missing' from the interviews or documents and I acknowledged that what was absent may also be important for my research. Interpretive validity is

instrumental for qualitative research due to the primary concern being what the findings *mean* to the people engaged in, and with, the research. Maxwell (2012) took the term 'meaning' to include "intention, cognition, affect, belief, evaluation, and anything else that could be encompassed in what is broadly termed the "participants' perspective," as well as communicative meaning in a narrower sense" (p.137-138). Our interpretations of the accounts can be valid or invalid depending on how the phenomenon is comprehended. Importantly, the researcher must base their understanding on the participants' perspectives and categories, not on those of the researcher (Maxwell 2012). I endeavoured to do this at all time and whenever possible I used terms that were derived from the participants' own language. This approach is not completely atheoretical as all observations, interpretations and descriptions are theory-laden, even if the theory is implicit or common-sense (as is also the case with descriptive validity) (Maxwell 2012).

Theoretical validity or a theoretical understanding of an account goes beyond description and interpretation. This third type of validity "explicitly addresses the theoretical constructions that the researcher brings to, or develops during, the study" (ibid., p.140). In this research into up-skilling, this meant deliberating over the relevance and influences of critical realism and the four-planar social being or Social Cube, as well as socio-materialism and practice theory. Maintaining this type of validity involved a steadfast commitment to open systems as revealed by critical realist researchers. The use of retroductive analysis was a key factor in this process and by developing an in-depth theoretical understanding, I ensured the validity of the accounts and findings in this research. A theoretical understanding treats an account's validity as an explanation but also examines the concepts that are employed by the relevant theories, as well as the hypothesised relationships between these concepts (Maxwell 2012). When applying these concepts to the phenomenon of interest, or social setting, there are aspects of the methodology to consider but what is more significant is that a realist approach to validity is concerned with the accounts or conclusions reached by using a particular method, in a particular context for a particular purpose, not with the method itself (Maxwell 2012).

Traditionally the procedures used to produce and validate an account have involved concepts such as triangulation or specific techniques such as audit trails or peer review. That is not to

say that these strategies have no role to play in qualitative studies. The value of these strategies relate to how the researcher collects data that will count as evidence for or against the conclusions and plausible alternatives that are being proposed (Maxwell 2012). In the following sub-section on 'Ethical issues,' I discuss certain measures that were taken to ensure this evidence has been gathered in a fair and trustworthy way in this research, but for critical realist studies, it is generally believed that "validity is not a commodity that can be purchased with techniques… Rather, validity is like integrity, character, and quality, to be assessed relative to purposes and circumstances" (Brinberg & McGrath 1985, p.13).

The concept of evidence plays a central role when discussing validity and it is crucial to recognise that evidence does not exist in isolation but only in relation to some claim (Maxwell 2012). Likewise, Chandler et al. (1994) argued that "question and evidence are therefore 'correlative' in the sense that facts can only become evidence in response to some particular question" (p.1). Both validity and evidence cannot be assessed in context-independent ways and neither can be evaluated on the methods used to obtain them. In qualitative research, the researcher strives to uncover what is actually happening in specific cases and this means including the participants' meanings, intentions, beliefs and perspectives which are essential parts of the events and processes that are being studied (Maxwell 2012). The primary purpose of evidence is to support claims about these events and processes and this is often where the strength of qualitative research lies (ibid.). As Maxwell (2012) asserted: "A realist reformation of the concept of evidence can provide a strong justification for the value of the evidence generated by qualitative research" (p.148). Furthermore, different claims will require different sorts of evidence and as this research was framed using a critical realist approach, abduction and retroduction were applied as modes of inference when gathering evidence to support the claims being made. These two analytical approaches are indispensable in critical realism research and Danermark et al. (2002) express this by saying: "To be able to discover meanings, relations and consistency, to be able to obtain knowledge of social structures and transfactual conditions, abduction and retroduction are necessary" (p.203). The argument that facts are theory-laden but not theory-determined also relates to the concepts of evidence and validity but, according to Danermark et al. (2002), the usability of knowledge will vary in various social situations, since there are many different levels and forms of social practice.

This is true in this research too and the knowledge that emerges from the semi-structured interviews, documents and observations must be contextualised using the theoretical framework developed for this study. The issues of validity and evidence were considered at all stages of this research and every effort was made to obtain evidence that could deal with plausible threats to the validity of the study's interpretations and conclusions. The theories applied in this research proved to be worthwhile lenses for viewing the up-skilling opportunities and practices and associated learning in the marine sector of South Africa and through careful analytical processes and retroductive inferences, credibility and quality of the conclusions was achieved.

4.7.2 Ethical issues

To ensure my research was conducted in an ethical manner I paid close attention to the recommendations made for social science and educational research from various sources. The social science researcher is confronted with a number of ethical issues when carrying out a study and these include policies and procedures regarding informed consent, safety, deception, confidentiality, anonymity, privacy and caring (National Research Council 2003; McMillan & Schumacher 2006). These were also outlined in the original proposal that was considered and approved by the Faculty of Education Higher Degrees Committee at Rhodes University, where the research was registered. For this reason, I regularly referred back to the proposal that was submitted at the start of my PhD journey to confirm that I was following through with what I proposed and that my methodology and data collection tools were in line with what was agreed on at the outset.

Expanding the list of aforementioned issues, it should be made clear that a central principle of ethical research is that of *informed consent*. This means that participants have voluntarily agreed to be part of the research and that they understand what they are agreeing to. Participants should understand what the purpose of the research is, why it is being undertaken and which institution is overseeing it. Thus, in this research into up-skilling and professional practices as these support learning in workplaces, I approached the possible participants from the various organisations with the appropriate background information and sought written permission from each of them (see Appendix B for the permission form). Initially, I had also been in contact with the highest authorities in the organisations or institutes that I hoped to include as case studies and got permission to interview the senior staff. As part of this process

of consent, I also got permission to include the organisations' name in my research. These measures also meant there was no deception involved in the data collection phase and the conceptual and methodological frameworks were open and honest.

In addition to the matters discussed above, the participants were also made aware that they had the right to withdraw from the research at any time, for any reason, as is recommended by Bassey (1999). With regard to anonymity, I informed the participants that their names would not be used in any of the written up work but in some cases it may not be possible to keep their identities anonymous, for example, the director of an institute, or where there was only one marine programme manager. In these cases, the participants were aware of these difficulties and agreed to continue. I also informed all participants in the research of their rights to verify the data before any of it is reported formally and member-checking occurred as I wrote up each case-study. By carefully working with abduction as a mode of inference for re-describing and re-contextualising the data collected from the participants, I upheld the integrity of this research and, as has been discussed previously, retroduction allowed for explanatory accounts of up-skilling opportunities and practices that lead to the basic prerequisites or mechanisms being brought to light in this research.

Bassey (1999) talked of being respectful when conducting educational research and I therefore endeavored to be aware and respectful of any cultural differences between myself and the participants. This extended to all the organisations involved, as well as other organisations in the marine sector. Researchers must also acknowledge the necessity of respect for *truth*, for *democracy* and for *persons* (Bassey 1999). Respect for truth can be linked to descriptive validity which, as previously explained, involves accurate recording of data and honest accounts of the research in question. To the best of my ability, I fulfilled these requirements during the data generation phase of this research, through systematic handling of the data and careful interpretation of the findings. Respect for democracy and for persons was shown by keeping an open-mind to different viewpoints and beliefs when it came to the semi-structured interviews and observations. More is said on personal reflexivity and positioning of the research in the following section of this chapter, but these aspects correspond to this idea of respecting democracy and persons. Bassey (1999) also encouraged the consideration of a fourth value relating to respect, which is respect for educational research itself. By this he meant researchers should conduct their research in a way which does not damage the future enquiries of other researchers, but rather they need to enhance the

image of research. To uphold this principle in this study, I was cautious not to discount the fact that the participants were giving up their time to be part of this research. Likewise, when permission was given from the higher authorities in the organisations or institutes, I was conscientious about being punctual for meetings or interviews and about not taking up more time of the staff than I had said I would. I also interpret the value of respecting educational research itself, as meaning the researcher must be mindful of any pre-conceived ideas, theories or perspectives that educational or social science research might have. Through being aware of these issues I undertook the research in a way that I believed would not compromise the work of any researchers that may want to work with these organisations in the future. Throughout the research process I also relied on consultations with my supervisor or conversations with critical friends when I had ethical concerns and these were invaluable for this study.

4.7.3 Reflexivity and researchers positioning

A vital aspect of carrying out PhD research is its contribution to new knowledge in the academy (the social field in which it is produced) and in critical realist studies, in particular, the new knowledge created must take into account *reflexivity*. In social science, discussions on quality, validity and analysis are not complete without including the practices of reflexivity that take place throughout the research process. These practices involve examining the social conditions of possibility (and therefore the effects and limits) of one's research in a way that is not narcissistic but allows for reflexive critique of the abovementioned social conditions of possibility (Bourdieu 2004). The notion of reflexivity described here, is one of field-based reflexivity, whereby the researcher needs to question how knowledge in the field or academy is 'traditionally' produced and validated. In addition to what has been discussed in this chapter up to now, I found questions arising from the biodiversity and marine sectors but also the social fields of workplace learning and skills development. Situating this doctorate meant returning to the Biodiversity Human Capital Development Strategy and considering what contributions are being made to the transformative agenda as well as the strategic objectives for skills development outlined for the biodiversity sector. The framing of my research questions around up-skilling, learning and professional practices led to certain conceptions and knowledge production for the biodiversity sector. It was therefore necessary to ask the question: How am I avoiding naïve understandings of what constitutes the 'real' in my

research and what struggles for truth are occurring in the context of my study? (see Bourdieu 2004).

The position of this research in the field, as well as the social space, was made clearer through conducting the formal observations that were described in Section 4.5.4 of this chapter and these contributed to the field-based reflexive analysis in this study. The MPA Forum was particularly helpful and the fact that I had previously attended the other, two, marine-focussed conferences that make up the other observation events, meant I had prior insights into the issues that the scientists and managers were facing. I also had an idea of who the key role players were in the marine sector. These insights re-enforced what I had discovered during the phase of contextual profiling when I had discussions with experts who provided background and contextual information with regard to MPAs, marine science research, and Human Resource policies or training initiatives. Armed with this knowledge, my practice of reflexivity included constantly critiquing and cross-checking my forms of thought so as to increase the chances of attaining the 'truth' as a social science researcher (Bourdieu 2004).

Personal reflexivity of the researcher is as important as field-based reflexivity and McMillan and Schumacher (2006) defined reflexivity as a broad concept that "includes rigorous examination of one's personal and theoretical commitments to see how they serve as resources for selecting a qualitative research approach, framing the research problem, generating particular data, relating to participants, and developing specific interpretations" (p.327). This description alludes to how reflexivity permeates all aspects of the research and research design and it is therefore essential that the researcher is aware of their positioning prior to commencing the research and while conducting the research. Maxwell (2008) explained that you must think about the kinds of relationships you want to have with the people whom you study and what sort of influence you, as the researcher, may have over the data that is collected. In other words, we need to acknowledge that "we are part of the social world we study" (Hammersley & Atkinson 2007, p.21) and it must be recognised that we have biases, beliefs, values and prior experiences that will shape our opinions on certain matters. When conducting semi-structured interviews, this is of particular importance as the interviewer has a powerful and inescapable influence on the data that is collected (Maxwell 2008). There are, however, steps that can be taken to lessen the influence of the interviewer in these circumstances, such as not asking leading questions (ibid.). As discussed in relation to validity and internal generalisability, the interview presents itself as a social situation and thus the

relationship between the interviewer and interviewee affects what takes place during the interview and how the interviewee's actions and views could differ in other situations (Maxwell 2012). During the semi-structured interviews with the marine scientists and managers, I was aware that any previous interactions with the participants or my positioning in the field, may have influenced the responses but as much as possible, I avoided leading questions that could have exacerbated this situation. As Maxwell (2008) pointed out: "what is important is to understand *how* you are influencing what the interviewee says, and how to most productively (and ethically) use this influence to answer your research questions" (p.243).

My positioning as the researcher in this study would largely be influenced by my background in the natural sciences and particularly my Master's in marine biology at Rhodes University. However, other factors such as being a white, South African, female would also be important and may have affected the relationships that were formed between myself and the participants. Any prior interactions/experiences with marine scientists in general and in some cases this included the scientists I interviewed, may have created biases or subjectivities in the data that was collected but I endeavoured to remain as neutral as possible during the interviews and observations and in representing views in the thesis text. I also may not have necessarily had as much experience with marine managers, in general, in the past, and this could have influenced the inferences made, or relationships formed, with these particular participants. Through self-reflection and by keeping a research journal I could constantly question my thoughts, biases and motives, because as Maxwell (2012) said, critical realist researchers need "to take account of the actual beliefs, values and dispositions that they bring to the study, which can serve as valuable resources, as well as possible sources of distortion or lack of comprehension" (p.97). On the whole, in this research, I believe I did everything within my means to remain aware of my personal dispositions and not allow these aspects of my positioning to influence the findings. By staying open to any concerns expressed by the managers and striving to understand the perspectives of the scientists, I have confidence that the data and the findings that were subsequently inferred can be considered trustworthy and valid.

4.8 Strengths and limitations of the research design/methods

The strengths of the research design in this study include the fact that close attention was paid to aspects of validity, evidence, ethics and reflexivity. The research questions were also well-thought out and were re-evaluated as the study progressed. In addition, thorough contextual profiling took place during the initial phases of the research. This process of contextual profiling focused on the organisations that would be relevant for the marine sector and not necessarily on the individuals at the organisations. For this reason, in my proposal it stated I would conduct semi-structured interviews with three managers or scientists at each organisation. It soon became apparent this would not be possible as the marine/coastal departments in most organisations were much smaller than I initially thought, sometimes only consisting of two or three staff and often only one person in a more senior/management position. This also meant that the person I would most like to interview was often too busy to see me and I had to adjust accordingly.

When it came to the number of in-depth case studies I had also initially planned on six in-depth case studies and then an additional four that would have been desk-top studies, simply over-viewing the human resource documents or capacity development strategies. However, when attempting this, and due to the fact that I was interviewing fewer people at each organisation, I realised it was not feasible to do six organisations as in-depth cases and the other four as desk-top cases. For example, the fact that some organisations could not provide me with skills development and training strategies meant these could not be analysed. Thus, to get the best idea of what up-skilling opportunities and practices were being actualised in the relevant workplaces, it was better to conduct interviews of as many individuals as possible and take a more in-depth approach at more organisations. Although SAEON (the South African Environmental Observations Network) was originally an option for a 10^{th} organisation, it became clear during the contextual profiling phase of the PhD, that I did not need to include them in the research as the work they do is largely around data collection, and processing and much of their work is in collaboration with SAIAB. Thus, only SAIAB was included in order to gain the insights I needed with regard to up-skilling and training of scientists.

As mentioned earlier in this chapter, another adaptation of the research design came about due to the observations not being linked to, or based at, the organisations that formed the case studies for this research. These opportunities for “in-house” observations were, in some cases,

limited to only the staff of the organisation being allowed to attend. In certain instances, the training events or workshops were held in other parts of the country and logistically I could not get there. The three observations that were done had value in their own right and although not as numerous as I had hoped, they contributed to the data and field-based reflexivity of this research in a meaningful way. The changes that occurred in my research design were not necessarily limitations but they merely shifted the focus of the methods to be more on the professionals' narratives gathered in the interviews and less on the organisations and their human resource policies regarding skills development and training.

CHAPTER FIVE – Exploring up-skilling opportunities and practices that exist in, or for, marine organisations

5.1 Introduction

Chapter Five marks the first of three chapters that examine the up-skilling opportunities and practices in the marine sector drawing on different theoretical orientations, which, as has been explained in previous chapters, explore the various aspects of these opportunities and practices and aim to reveal the deeper mechanisms at work. As a starting point for this process, it is essential to look at what opportunities and professional practices already exist. By using the sayings, doings and relatings of practice theory, the practice architectures that exist in support of up-skilling in this area of skills development and human activity, can be described. In this chapter I aim to explore, using thick description, how the up-skilling opportunities and practices are constituted and enacted via the sayings, doings, and relatings. As will be seen in the chapter, this offers a clearer picture of how these practices are situated in time and space (Schatzki 2010) and provides a solid foundation on which the findings can be discussed in more depth, in the succeeding chapters.

Kemmis and Heikkinen (2011) described how bundles of sayings, doings and relatings 'hang together' in the overall 'project' which is the overall purpose of a practice that gives it coherence. Thus, the 'project' or practice under discussion in this chapter is up-skilling and the discussion relates to the first sub-question of this research:

> What up-skilling opportunities and professional practices exist in or for, marine conservation organisations and how are they constituted and enacted via practice-based sayings, doing and relatings?

To answer this question each case study will be explored in the form of a narrative account of the up-skilling opportunities and learning in, through or for the workplace that occur according to the participants at the various organisations and institutes. In addition, the insights from the documents and observations that were included in the data analysis phase of the research will be explored. The organisations/institutes that make up the case studies were introduced and described in Chapter One and more details on the participants, documents and observations were given in Chapter Four. Although the participants differ in that some are more advanced in their careers than others, it should be noted that the focus of this research is on marine professionals and specifically on senior managers and scientists who can reflect on

their experiences of up-skilling in the marine sector, as well as explain other opportunities and practices they know about.

5.2 Case study one: ORI – SAAMBR

As reported in Chapter Four, I interviewed four scientists at ORI and one of them had attended and presented at the conference that makes up Observation V.2. No documents relating to skills or human capacity development could be sourced for this case study but a number of peer-reviewed papers were included as examples of the marine issues or topics the scientists were researching. In Chapter One, the mission and vision of ORI/SAAMBR were outlined and it was mentioned that the majority of the participants in this case study had taken a 'traditional' academic path, meaning they had gone to a university to do a undergraduate degree, gone on to do an Honours and Master's, and completed their doctorates at some stage (sometimes only later in their careers). Of course, as is often the case, many of the participants did not go straight from one degree to the next, but worked or travelled in between. This is explored later as an important aspect of their training, learning and professional as well as personal development.

The director of ORI described the institute as one that "supports conservation through research, education and getting the message out" (ScientistR4) and this statement already says a considerable amount about the practices (the sayings, doings and relatings) that the institute strives to achieve or carry out. By choosing words such as 'supports conservation' and 'education', the director clarified that conservation and education are the main concerns of the institute and one can consider the skills and knowledge that might be required or expected from the employees. He went on to describe an important 'doing' with regard to the main activity of the scientists: "we do research, but we also do research consultancy" (ScientistR4). Thus, it can be extrapolated that the practices in the workplace revolve around research that supports conservation of marine and estuarine ecosystems and much of this includes educational aspects.

5.2.1 The constitution and enactment of up-skilling opportunities via sayings and doings

Available opportunities

When asked "what's out there?" and "is it enough?" the scientists at ORI seemed to be of the opinion that there were sufficient opportunities available in the marine sector, although, as

the one senior scientist put it, the opportunities are often "driven around a specific initiative, be it MPA training, or taxonomic identification" (ScientistR1), and he went on to say that this is usually when an expert in say, taxonomy, is in the country and has time to run a course, workshop, or training programme. The same scientist responded to a question about how easy these opportunities are to find by saying: "Yes and no. We don't always get to hear about things that are based in the Cape. Somehow we seem to slip through" (ScientistR1). These conversations around what is available and the sayings that emerged from them, give valuable insight into how the scientists at ORI, as a KZN-based institute, see and feel about the up-skilling opportunities available on a national scale. Links can also be made to relatings, as the above quote reflects a 'slipping through' (the cracks) when it comes to hearing about opportunities elsewhere.

Approach to up-skilling

The director of ORI explained how the institute approaches skills development by saying: "the idea is, we trying to up-skill our staff all the time" (ScientistR4). This shows how they aim to make up-skilling a continuous process bringing to mind the concept of lifelong learning which has been associated with the term 'continuing education' (Walters & Daniels 2009). He went on to say that "The problem is, we don't have much movement in this place – there's not a lot of scope to grow in this organisation unfortunately."

Purpose of up-skilling

The above statement is an example of a challenge faced by the scientists at ORI as well as many other marine organisations. As a researcher, it brings to mind the question of: Up-skilling *for what*? If one is up-skilling to keep 'up-to-date' and in touch with the latest advances in technology or research in a certain field, then growth or 'movement' in one's career is not necessarily a concern. However, if one has aspirations to move to a more senior position, or wants to move laterally into a different position, and has up-skilled for this reason, then one may become frustrated if there are no opportunities to do so. This poses further questions about how much an individual considers their future prospects when engaging with an up-skilling opportunity, or is it simply a case of up-skilling with the hope that there will be opportunities to use their new skills or knowledge?

Significant experiences and events

When discussing experiences and what events played a role in determining where they ended up in their careers, one scientist commented that it was a "fantastic trip down to Marion Island" (ScientistR2) during her Honours year at university. Although this would, in fact, be a doing, and involves a very material aspect of her past in terms of the experience she had on the cruise and doing research on Marion Island, it was significant that she described it in this way (a saying). By speaking about the trip in such a positive way and insinuating that it had such a big impact on her choice to continue her studies in marine research, she expressed the importance of practical experience and exposure to real-world situations in the field of marine science.

One of the reasons for approaching senior scientists or managers was to ensure the participants in the study could talk from a range of experiences and provide meaningful reflections on what was influential in their working lives, in terms of skills and learning opportunities. This emerged clearly when discussing defining moments of the ORI director's career and in the way he described these moments: "These were all watershed moments" (ScientistR4). This comment was in the context of a discussion about his career path and how he got to where he was at the time of being interviewed. The concept of a watershed moment was significant and in subsequent interviews within ORI and at other organisations, I used this imagery to spark discussion around career choices and new skills demands, or learning opportunities that participants may have encountered. The interview with the ORI director continued from the 'watershed moments' comment in the following way:

> "I ended up working in the field and I learnt all these skills."
>
> And then in the next job, "I learnt a whole different set of skills. And then I came back to learn a whole new set of skills about how to design research facilities and what goes into them; how to make them work."
>
> Adding: "I learnt about business management…" (ScientistR4)

These sayings are also associated with the 'doings' as they describe his actions and how new skills were required in the different positions he took up. When an opportunity arose for him to get practical experience in the field, this required certain technical skills. This would have influenced his future opportunities and possibly also his decisions about what sort of work to continue with or move into. When talking of work, activities, or actions, it must be kept in mind that within practice architectures, these doings presuppose the existence of certain

arrangements in physical space-time, such as shared locations and/or time periods in which people can interact and share activities and work (Hemmings et al. 2013).

Speaking as the director, about ORI, he also mentioned an important doing with regard to the up-skilling practices in physical space-time at the institute by saying: "We keep training people all the time" (ScientistR4). Again, here he emphasises the importance of training not merely being a once-off event or taking place in a set time and place. By striving to make it an ongoing process, the training and furthering of skills can be viewed as a positive investment in the employees. These training (or up-skilling) opportunities can also come in many different forms and some of the activities that were mentioned by ORI employees included diving courses, statistical software courses such as R, workshops such as an IUCN red-listing workshop, or courses on larviculture and feeding of young fish (the latter taking place at Ghent University in Belgium). It can be assumed that these up-skilling opportunities that came to mind were the more significant ones; no doubt many others were not mentioned. However, the experiences described by majority of the participants point towards the more hands-on opportunities being the influential ones and for one senior scientist, a significant event, or what I have classified as a 'doing', was when she had been overseas for a few years but returned to South Africa and "did a little stint, a research assistantship with Professor Cyrus who was running the unit" (ScientistR3). The research unit was in Zululand and dealt with aquatic science but in an applied way, involving communities, people and considering issues of sustainability such as overutilisation, which caught ScientistR3's interest. It was this assistantship that essentially set the participant on her career path. Such internship-type work has also been shown to be highly valuable by authors such as Lave and Wenger (1991) with their work on Situated Learning as well as Stephen Billet and much of his research into workplace learning (Billet 1994, 1995, 1996, 2001, 2008) (see Section 2.2.1).

Communication skills

Something that emerged as important was the communication between scientists and managers. In recent years there has been a worldwide call for better communication channels between research and management[9] (Knight et al. 2008), and this is also true for marine and

[9] Knight et al. (2008) referred to this as the research-implementation gap and they considered it a genuine phenomenon and a specific example of the "knowing-doing gap" (Pfeffer & Sutton 1999) that is widely recognised in management science.

coastal conservation. The emphasis has been on *relevant* science being done (relevant meaning science that takes into account the current conservation and management needs or issues) and therefore practical recommendations for management, so that the research can be applied in more significant ways. I considered this drive for better communication in terms of the skills that would be required by the people involved and due to the fact that I was working with both scientists and managers, it made sense to include this aspect of their working lives in my data collection. The theme of communication can also be said to be one of 'bridging the gap' between science and management; it reoccurs in the different cases in various forms. For the scientists at ORI in particular, this issue of communication filters into much of their research. ScientistR2 made this clear by saying she believed strongly in applied science and this was reflected in her PhD research which included submitting management recommendations once it was completed (in her case, these recommendations were to Ezemvelo). She said it involved: "Looking at what my data said [and how it would] translate into management recommendations. So I think that's really important" (ScientistR2). More evidence of this applied type of research can be seen in the papers published at ORI which were presented in Section 4.4.1. Papers such as the one entitled "An assessment of integrated coastal management governance and implementation using the DPSIR framework: KwaZulu-Natal, South Africa" or "Changes in recreational shore anglers' attitudes towards, and awareness of, linefish management along the KwaZulu-Natal coast, South Africa" show the links to management. These efforts being made to improve communication channels form an integral part of the working lives of the scientists at ORI.

When considering the skills around a 'doing' such as this, it is clear that the scientist conducting the research needs to be positioned in such a way that there are opportunities to communicate with the relevant conservation agency, or they must know how to create these opportunities. In many ways this will be highly dependent on personality and there needs to be *will* behind the research in order for the findings of the science to be applied in real-life, management and conservation situations. So it could therefore be asked: where or how do you learn to communicate in this way?

5.2.2 The constitution and enactment of up-skilling opportunities via relatings

This idea of will, or motivation, as well as passion for one's job is discussed in more detail in Chapter Six, in relation to agency. However, the above question about where or how one

learns to communicate, could be comparable to how relationships are formed in workplaces and in practice theory, this falls into the social space of 'relatings' where individuals in a shared practice, interact with each other and there are aspects of power at play (Hemmings et al. 2013, see also Section 3.3.1). Skills related to this social space, where the relatings of the professionals influence their practice, may not necessarily be learnt or acquired through any specific training and as with the communication skills mentioned above, could be influenced by personality type and previous experiences.

Power and politics

Kemmis and Heikkinen (2011) described relatings as being the social-political dimension of practice and in the current study, it became clear that this aspect of the marine sector was complex and had multiple players to consider. From the outset there were obvious powers and politics involved between the relevant government departments and the organisations or institutes that were included in the research, but in addition there were interactions between organisations and within organisations.

In the case of ORI, this was revealed as follows: at the time of collecting data, they had a strong relationship with the provincial department of Economic Development, Tourism and Environmental Affairs. The interactions with the national departments of Environmental Affairs, and the Department of Agriculture, Forestry and Fisheries, on the other hand, were less engaged for certain projects.

In terms of the relationship with the local conservation agency, the director of ORI said that "we [are] working very hard on our relationship with KZN Wildlife" (ScientistR4) (that being, Ezemvelo KZN Wildlife, another case study of this research), indicating that efforts were underway to establish and sustain valuable links to the conservation organisation. When considering these relationships, it is clear that the level of engagement in the relationship should be considered in terms of how it might affect the up-skilling opportunities and practices. For example, if ties are still in development, or are weakly constituted, there may be several limitations to the knowledge resources, as well as financial/material ones.

Networking and conferences

With regard to relatings and knowledge sharing, an essential component to consider in the marine sector emerged around attending conferences, where scientists (and sometime managers) can interact with each other. At ORI, the feeling among participants was that often smaller, more specific conferences were the most useful, for the stages they are at in their careers. ScientistR2 gave the example of a telemetry conference where there were only 120 people attending. She said she found "the smaller conferences a lot more useful than the big conferences", while ScientistR3 responded with "critical, if you choose the right conference" to the question: Are conferences important? She went on to say "I've really enjoyed going to [the] very focused, smaller ones, where you can actually interact one-on-one." I included conferences as up-skilling opportunities as they are very often events where learning and networking takes place. They provide a space for learning about what other research is happening in the field of interest, as well as a valuable space for staying up-to-date with the latest technologies or methods being employed by researchers in the field. These ideas are evident in my findings but also in the observations V.2 and V.3 at the Southern African Marine Science Symposium and the Marine Protected Areas Forum.

Another key aspect related to conferences, as this is often where you will meet experts in the field or fellow researchers that might be future collaborators, is making connections or contact with certain people, in this case other scientists. These connections can also be taken as 'relatings' as professional relationships are formed with other people and usually the associated institutions. As has been previously mentioned, the scientists at ORI all have doctorates and in the case of the one senior scientist, who had recently been made assistant-director at the time of interviewing, his co-supervisor for his PhD was an international expert in the relevant field. During his PhD, this expert was influential in the learning and skills development of the now senior scientist and the comment was made: "that sort of mentorship is very useful" (ScientistR1). This gives a good example of a person in a powerful position (the co-supervisor of the doctoral research) having a positive relating with the scientist and therefore creating the social space for learning and self-development. Another scientist at the institute, ScientistR3, described how she maintained contact with colleagues after her undergraduate and Honours while she travelled, and in this way she kept in touch with what was happening and who the leading researchers were in her field of interest. Thus, when she returned from her travels wanting to do an MSc, she knew who to approach about a possible

project and this led to her doing a Master's and then PhD, and ultimately becoming a scientist at ORI. In these instances, and in others that will be described in the following case studies, these relatings have steered an individual towards a certain path and made opportunities available that they may not have had without these relatings. These encounters seem to instil a sense of passion and meaningfulness in the work and workplace practices of the individual, which in turn, affects the up-skilling opportunities and practices they will seek out.

5.3 Case study two: SAIAB

As SAIAB is also a research institute, the same holds true that all of the participants of the current study had doctorates and most individuals that were interviewed followed a traditional academic path, as was the case with the participants at ORI. Once again I approached senior and principal scientists in order to gain a rich history and background of their training and up-skilling and as stated in Chapter Four, I interviewed three scientists. Two documents were also analysed for SAIAB and two of the three observations were significant for this research institute as the director presented at the MCEN Conference (Observation V.1) and the other scientists attended and presented at SAMSS (Observation V.2). As with ORI, the managing director was one of the participants and although the director, I consider him a scientist due to his background in marine science and therefore, I index coded him as such. When describing SAIAB and the principal scientists, the director said the following: "In terms of academic training, we are sort of at the end of the pipeline… [The] academic development of the staff, purely in a science trajectory, is relatively limited because they are regarded as academically quite well trained" (ScientistÄ3). This comment situates this research well, but it must be noted that although future opportunities may be limited for these senior or principal scientists, the retrospective approach taken in the interviews aimed at exploring aspects of their training or careers that enabled their reaching the level of senior scientist, at a research institute like SAIAB. The relevant sayings, doings and relating of practice architectures are used to uncover the abovementioned aspects and the up-skilling opportunities and practices are investigated.

5.3.1 The constitution and enactment of up-skilling opportunities via sayings and doings

Available opportunities

The discourse around up-skilling of senior scientists at SAIAB was one of an individualistic nature where, being at such a high level, with other scientists or post-doctoral researchers

working under them, they would generally identify up-skilling opportunities on their own unless the training was specified by the SAIAB human resources department or administration. According to the managing director of the institute: "And then if you are talking about up-skilling of scientists per se, that will be driven by the scientist, who would then approach us if they need additional resources" (ScientistÄ3). He also gave examples of possible up-skilling opportunities such as "higher level modelling courses, oceanic modelling courses, all that sort of stuff". So the scientist may identify something like a specific statistics course in telemetry that he/she feels would further his/her skills and knowledge base, and would then approach the senior management of SAIAB about attending. In a similar vein, the director explained that considering they all have PhDs, any further training or education would essentially be up to them:

> The additional certifications are skills that they will choose for themselves to enhance their careers. So it's not a forced mandate, other than the management style, bureaucracy ones as they call them; in terms of managing their finances and their staff. (ScientistÄ3)

This is a reflection of the stage at which these scientists are at in their careers and there is a certain amount of trust involved; these scientists are trusted to act professionally and identify what will be most useful, in terms of their knowledge or up-skilling needs. In this case, this system seemed to work well and from the individuals I interviewed, all were satisfied with the current system. What has been described above was reinforced by the main document that was analysed for this case study, the *Consolidated Human Resources Policies & Procedures Manual* and in particular the section entitled 'Education, Training and Development'. This section describes how SAIAB aims to invest in "employee growth and development, both personal and professional, through the development of individual skills and competencies" (p.16). It goes on to describe how the PDP or personal development plan serves to outline the training and development interventions that the employee plans to undertake in order to "improve their level of performance in the job, and to further develop their skills in relation to their function" (p.18). The agency involved in this process of drawing up a PDP relates to what was said earlier about the scientists at SAIAB being responsible for their own training and development.

The sayings surrounding formal degrees at SAIAB were, on the most part, that university degrees are necessary in this field but there are opportunities for technicians, for example, to become more involved in the scientific aspects of the research. When discussing this subject

with the chief scientist at the institute, he talked about technicians up-skilling in order to make this move which he believed was possible, saying:

> … and not go through the conventional sort of system, and I think that's right that that opportunity is available. But generally you find once a person becomes a technician as such, they are there to support the scientists and the more skills they acquire within that area, the better. (ScientistÄ1)

He went on to say that as technicians, they do of course also have the opportunity to co-author papers with the scientists when working on a project, so "it doesn't exclude them from participating quite directly in the science" (ScientistÄ1). This begins to introduce some of the doings at SAIAB and one can start to imagine the wide range of skills and expertise that are required at an institute which is well known for its top-end research into a multitude of aquatic environments. One only has to scroll through the list of designations of the staff members at the institute to realise how many different aspects of marine and freshwater environments are covered; from instrument scientists, marine technicians and specimen cataloguers, to a molecular lab manager. This is in addition to the various levels of scientist at the research institute and the director explained that additional skills the scientists might seek out would include courses in genetics or statistical methods, such as using R. Furthermore, the instrument scientists or post-doctoral fellows may take up the opportunity to do management courses, such as the New Managers' Development Programme (NMDP). This programme is presented by the National Research Foundation (NRF) in collaboration with the University of Stellenbosch Business School and aims to enhance the skills and competencies of upcoming new managers (SAEON, 2016). Other types of training that were mentioned included skippers training, first aid courses, health and safety, maritime safety training and class four dive courses. These examples were also present in the training information document (from 2012-2016), that was included in the data analysis phase of this research. The director confirmed that these skills were not necessarily requirements when coming into a scientist or technician position at SAIAB, but were encouraged and often essential when the individual was in the field.

The question of field experience often leads to discussions about diplomas and whether university degrees are really the best way to equip an individual for a career in biodiversity conservation. In 2001 the South African Minister of Education released a National Plan for Higher Education that called for fewer higher education institutions and this resulted in the technikons merging with already existing universities and all the colleges of education were

absorbed by universities (Jansen 2004, Mundy 2010). So although diplomas are still available, they are not as common as they were prior to 2001 and this is seen as problematic by some; for example, one of SAIAB's principle scientists had the following opinion, when discussing the importance of degrees:

> I see a bigger failing at the way our education system has been transformed, where we used to have all those training colleges. So they did away with that, right from training teachers. … So the technikons with nature conservation diplomas [are gone and] there's a huge need to have a marine conservation diploma. (ScientistÄ2)

Although this statement is not 100% accurate as diplomas in Nature Conservation are available, for example at the George Campus of Nelson Mandela University (NMU) or the Cape Peninsula University of Technology (CPUT), it hints at the need for a more specific marine and coastal conservation diploma and expresses the scientist's frustrations with the skills and training opportunities that are available in the marine sector.

The HR manual that was mentioned earlier also states that the organisation may, from time to time conduct "skills audits/skills needs (gaps) analyses" (p.7) which would compare training needs and requirements, with actual skills, through the workplace skills plan. This shows the commitment of the research institute to staying up-to-date and current with the training and up-skilling opportunities they offer and it seems like much thought and effort has gone into the discourse and actions required, as outlined in the HR manual that includes the education, training and development policies for SAIAB.

Transformation in science/research

In an earlier quote the managing director mentioned the more bureaucratic certificates that SAIAB scientists are required to do. These are generally HR-related courses which are compulsory and in 2015 they started running a range of transformation workshops which consider diversity at the institute. On this point of diversity and transformation, an important 'saying' was noted when the director gave his thoughts on racial diversity, explaining that he thinks marine science in South Africa is not as transformed as marine management and that there is a gap in the skills development and training systems in that regard. He called it "an apartheid legacy, between management and science" (ScientistÄ3). The issue of transformation is a complex one and cannot be ignored when considering workplaces and marine professionals. In this research, it was discussed from a number of angles in the

different case studies and it is, in fact, one of the main driving factors behind doing the skills research in the biodiversity sector of South Africa, as discussed in Section 1.1. In this study, only four of the 17 interviewees were black South Africans, and none were black African females. The dominance of male participants is also apparent, as I only interviewed five females in total. This speaks volumes to the issues surrounding employment equity and transformation in this sector. Although I do not deal with the complexity of the socio-political arrangements that create this bias of race and gender to its full potential, the persisting inequalities in the marine sector are quite clear. The topic of transformation in the marine sector of South Africa is certainly an area that needs further work and while this study focuses on the skills, practices and opportunities surrounding marine research and management, it cannot ignore the relevance and importance racial and gender equity in South African workplaces.

Publishing as a means of communication

The doings associated with up-skilling and training really culminate in one of the final points the director made which was that "SAIAB runs quite a comprehensive performance management system, a very detailed one [and] part of that is ongoing training" (ScientistÄ3). The emphasis on the fact that the training is, or should be, "ongoing" gives a good sense of the nature of the up-skilling at SAIAB and as part of this system, staff members put down goals or outcomes they plan to achieve in the upcoming financial year and generally these goals include publishing papers. In an academic institution, it is generally expected that the research staff will have the skills and motivation to publish in scientific, peer-reviewed journals and this issue is multi-faceted, so was explored to some extent through this research into up-skilling opportunities and practices. The same scientist that mentioned technicians being able to co-author papers gave his opinion on publishing: "I firmly believe that scientists should publish, locally, in local journals, as well as internationally… So that you are almost getting the best of both worlds" (ScientistÄ1). He remarked how publishing is often used as a benchmark in science and it can ensure productivity and relevance of your research. It is important when hiring a scientist for a position in a research institute, like SAIAB, and on this subject ScientistÄ1 said: "When you apply for a job; one of the criteria we use when we appoint a scientist is we look at what their publication record is". The emphasis on publications was also clear from the numerous peer-reviewed papers available for SAIAB when collecting this data (eight of these are presented in Section 4.4.1). Many of the papers

also allude to the skills that are involved, such as ‘Use of remote underwater video to record littoral habitat use by fish within a temporarily closed South African estuary’.

This *doing* of publishing peer-reviewed papers gives insight into the way formal qualifications are prioritised in many ways and particularly in academic settings. Formal and informal learning or up-skilling opportunities are discussed in more detail in Chapter Six but it is of interest that the sayings and doings surrounding publishing and formal certification permeates through to many different issues and topics. For instance, when talking about communicating science to the public and research having an impact in the public sphere, a principal scientist at SAIAB said the following:

> I don’t think the impact; the true impact is worth anything. It’s an impact just to tick boxes. It’s a bit like science: Did you publish papers? Did you attend conferences? Tick, tick, tick… But what we [are] doing does not address what I see to be the big problem out there; it’s informing the general public and educating the people that are involved with marine conservation. (ScientistÄ2)

Conflicting perspectives are to be expected and although ScientistÄ2 clearly felt differently about scientific publications, it is generally accepted that the more papers a scientist publishes, the more recognition will be given to him or her in the scientific community. However, the issue of science being ‘relevant’ and applicable for managers (as was brought up in the previous section) is one that the managing director felt needs attention: “I think particularly within the South African context, the gap between management and science is too large and can be improved upon” (ScientistÄ3). The principal scientist who spoke about informing the general public and educating those in marine conservation, which would include MPA or coastal managers, pointed out that scientists used to advise the government departments on management decisions but in recent years they employed managers that “don’t have any true background and knowledge of fish and fisheries, and they’ve cut the scientist leg out” (ScientistÄ2). Sentiments were similar on this topic and ScientistÄ1 said “if you don't communicate, that knowledge is not transferred” and later: “That skill of being able to talk across is a fairly rare one” where he means, across the divide between science and management. A peer-reviewed paper that deals with management, the environment and the public is entitled, ‘The role of the Tsitsikamma National Park in the management of four shore-angling fish along the south-eastern Cape coast of South Africa’. This title shows how the researcher has worked with the relevant park and shore-anglers, to draw conclusions about the management of the species of interest. The relatings and interactions between

scientists and managers are discussed in the following section but as the managing director stated, “it’s an ongoing challenge in terms of communicating the science” (ScientistÄ1) and it will no doubt require effort from both sides.

5.3.2 The constitution and enactment of up-skilling opportunities via relatings

The relatings associated with up-skilling opportunities at SAIAB were similar to those at ORI and those relatings that were apparent involved conferences, communicating with others in the sector and certain people that the participants had encountered through their working lives. At SAIAB, the scientists have a quarterly research forum where challenges and opportunities are communicated and discussed. The communication between scientists will be influenced by who holds the more powerful positions and whether the scientists at the various levels feel confident to speak up about their ideas or concerns. The managing director commented on the power relations, saying: “I think we have a slightly more hierarchical structure than a university” (ScientistÄ3), where technicians work for the scientists; scientists are managed by principal scientists, who report to the director. This situation could mean that the principal and chief scientists have more say in what up-skilling or training opportunities are available and to whom. However, this was not directly implied by any of the participants and such power relations may be absent due to the academic nature of the workplace and the level of professionalism of these scientists.

The relationships between the executive managers at SAIAB and the employees also seemed to be positive and the notion of professionalism is upheld in this way. Evidence for this is present in the HR document on Education, Training and Development, as it outlines how these managers are responsible for aligning the “ongoing skills development” of the employees with the “achievement of organisational objectives” (p.8). Another relating that is mentioned is that between the NRF and the relevant SETA. The statement in the document was regarding the development of a workplace skills plan and quality management. However, in this case the ‘relevant’ SETA is not CATHSSETA as the NRF belongs to the Education, Training and Development Practices Sector Education and Training Authority (ETDP-SETA) and although not totally clear, it can be assumed this is who was meant when including the phrase ‘the relevant SETA’.

Conferences and communication

In terms of scientists interacting with marine and coastal managers, the overall feeling was that a formal structure would not improve the communication between scientists and managers but that it is more about forming one-on-one relationships that are built on trust. An important point was made in that: "there is quite a large amount of tension between the fact that management and science don't always see eye-to-eye on marine resources" (ScientistÄ3). One way of forming better relationships and furthering the communication skills of scientists (and managers) is having conferences where both parties attend and can discuss the research that is being presented. The principal scientist, ScientistÄ2, noticed the presence of more managers at the last SAMSS (Southern African Marine Science Symposium) he had been to, while ScientistÄ1 said he felt that "cross-pollination [between scientists and managers is] a sign of a healthy situation". One such example is the manager, ManagerB1, that was also interviewed as part of this research. He is well-known amongst the scientists at SAIAB as a manager who will pick up the phone and ask for advice. In ScientistÄ1's opinion, this kind of communication and collaboration can lead to successful management decisions and he commented that ManagerB1 is a manager that "can do that communication, so he is bridging the gap" (ScientistÄ1). Another example was a fellow SAIAB scientist, (ScientistÄ2), who has transcended the gap between science and the angling community and has thus improved the state of certain fish populations along the South African coast. If one considers this a skill, it brings us back to the question of where this can be learnt or is there any way of training an individual to be a better communicator? One possible solution is mentoring or internships, where the benefits of interacting with others can be experienced first-hand, or possibly more support from the government departments that are involved in research and management. The relatings of the national departments to the scientists at SAIAB, and scientists in general, emerged in a few instances and according to ScientistÄ2, "I think what has happened, over the last 20 years has been this paradigm shift in terms of how government perceives research, the need for research and the implementation of research findings". Here, he not only touched on the role of the government but also brought in the aspect of research findings being applicable 'on the ground'. All these relatings have an impact on the up-skilling opportunities and practices by either enabling certain conditions for these opportunities to be taken up or limiting them.

5.4 Case study three: DEA – Oceans and Coasts

In Chapter Four I explained how a group discussion was held at the Cape Town office of DEA with one scientist and three managers, who were available to meet with me from DEA – Oceans and Coasts (see mandate and description of the organisation in Chapter One). Four documents were included for DEA and the one manager that participated in the group discussion was at the MPA Forum which made up Observation V.3 in this research. As this was a group discussion, the interview schedule was slightly adjusted due to the fact that I could not ask for the specific details of each person's experiences. However, I gained some valuable insights into the up-skilling opportunities and practices that Oceans and Coasts are involved with and the sayings, doings and relatings described below, draw on these insights.

5.4.1 The constitution and enactment of up-skilling opportunities via sayings and doings

Available opportunities

The discussion around formal qualifications and opportunities was fairly extensive and all the participants had a positive view of short courses, describing them as 'very good', 'worthwhile' and 'excellent' for both managers and scientists. This agreement by the DEA staff members regarding the value of short courses, reaffirms what was stated in Chapter Two, that is that in South Africa there is an emphasis on accredited courses, such as short courses. Research into short courses in South Africa shows that the strategy of providing short courses is often seen as not being particularly effective for addressing the long-term needs of an organisation, in terms of their human capital requirements (Walters & Daniels 2009) and Fenwick (2010a) pointed out that an injection of skills and information can be considered a quick-fix, while the real challenge is to find an ongoing dynamic process for adult learning. Another example of a popular opportunity was the *doing* of the MPA management training that ScientistG1 said most of the management staff in Oceans and Coasts had participated in. This is not surprising considering DEA organise and fund this training, along with WWF, who contract experts to run the programme. The MPA management training course is still considered external; however, there are also 'in-house' opportunities such as statistics courses that are run for the Oceans and Coasts staff and interns by one of the other senior scientists.

The other formal up-skilling opportunity that is common is a degree through a university or technikon and at DEA this is also encouraged for more junior staff that are looking at getting

into the science and research side of the marine sector. ScientistG1 explained how DEA approach external supervisors from the relevant university departments, to come in and through their specialised expertise, the goals of Oceans and Coasts can be achieved. He claimed that these goals include "a happy and better qualified staff" (ScientistG1). On a similar note, ScientistG1 admitted that there is room for improvement when considering skills development but in general he felt the opportunities are there and are being taken up: "there are definite gaps where we could round off our capabilities better, but there are also very definite areas where we are giving people opportunities to perform at a higher level" (ScientistG1). Within the Oceans and Coasts branch, ManagerG1 added that what is often done (i.e. a 'doing'), is the supervisors of a section will identify an interest or strength in an individual working under them and aim to develop or take that interest further. So he describes it as a "case-by-case study" (ManagerG1) when it comes to training and skills development. The discussion then moved onto the role of interns and how, in Oceans and Coasts, they often form an integral part of the team so opportunities are also made available for them to further their skills and knowledge. The hope with the interns is that they will stay in the biodiversity sector and if or when a position becomes available, they will have the experience and qualifications to apply. This approach works in some, but not all, cases.

Interestingly, DEA's Strategic Plan 2015/16 – 2019/20 lists the departmental goals, of which one relates directly to up-skilling and learning in the workplace. The relevant goal is: to improve service delivery and capacity as well as capabilities through creating "a harmonious and conducive working environment" (p.27) and it goes on to mention developing an effective Human Resources strategy to "attract, develop and retain a skilled, transformed and diverse workforce that performs in line with the DEA Culture and Values" (p.27). Under the title Human Resource Strategy, the document elaborates that the "Department's ability to attract and retain the right skills and talent is a critical element towards achieving its planned strategic objectives and delivering on the constitutional mandate" (p.61). The fact that here the document uses the phrase the "*right* skills and talent" is significant and brings awareness to the appropriateness of the skills, and I would argue the knowledge too, that the Department needs. The inclusion of the term a 'transformed and diverse workforce' is also of interest as this links back to the theme of transformation in the sector.

As stated in Chapter Four there is not a strong emphasis on peer-reviewed papers within Oceans and Coasts and the two published papers that were sourced from the participants were

focused on fisheries in South Africa, although the one from 1998 could be considered outdated. However, this is not to say that the staff at DEA – Oceans and Coasts, do not make valuable contributions to research in other ways. The support provided to researchers by Oceans and Coasts and collaborative efforts are also meaningful *doings* and should not be overlooked.

Operation Phakisa

The government initiative to develop the 'Ocean Economy' is known as Operation Phakisa and is headed up by DEA. Thus, we spoke in some detail, about the human capital requirements involved in implementing this initiative and ScientistG1 pointed out that "it's also giving us new skills by… people get assigned to various things in quite a significant way, for example [ManagerG2] has been assigned to water quality initiative". I consider this 'saying' of "new skills" to be an interesting and important insight into the nature of the marine sector and the careers in certain branches, such as DEA – Oceans and Coasts. It introduces an element of change in the working environment and is critical when considering up-skilling opportunities and 'keeping-up' with current developments in the country's socio-economic and political climate. Another example of how Operation Phakisa was influencing their working lives, was ScientistG1 mentioning a 'doing' for him, which was that he was having meetings with the oil and gas industry every second week,[10] which he described as "quite a learning curve". Interactions like this also fall into the relatings of practice architectures and once again the issue of communication arises, along with the aspects of power and politics that professionals in the marine sector have to deal with. These are picked up again later in this chapter and in the following chapters.

Specific training

The abovementioned MPA management training is one example of more specific training, but ScientistG1 explained how there are certain areas that require specialised skills and this is what they need to work towards in the Oceans and Coasts branch. He also mentioned that DEA have an overall work skills plan but in recent years there have been many vacancies in Oceans and Coasts. However, these vacancies have been filled and now the staff are there, but as he said: "now we need to get the skills development in the particular key areas where

[10] The oil and gas industry are involved due to the one approach of Operation Phakisa being to survey for offshore gas deposits that could be extracted.

we are maybe lacking" (ScientistG1). These aspects of human resources and human capacity development come through in the Strategic Plan that was referred to earlier, as well as the Annual Performance Plan (2017/18), which talks about the HR strategy and how it should ensure DEA is a "learning organisation that values diversity" and how the HR strategy aims to "make optimum use of its human resources by anticipating and managing surpluses and shortages of staff to support the achievement of the departmental strategic objectives" (p.5). However, this is with regard to DEA as a whole, and I would suggest that it is not enough to merely meet the strategic objectives of the organisation, as this will not necessarily address the specific requirements of the different branches. In this case, the Oceans and Coasts branch have certain skills and knowledge that are needed and the up-skilling opportunities that relate to these needs do not seem to be available. An example can be found when it comes to research and in the review of what was then, DEAT (the Department of Environmental Affairs and Tourism), under Marine and Coastal Management, the document states that "the capacity to carry out social and economic research is another challenge" (p.109), when it comes to fisheries management in the face of poverty and how climate change will affect resources, economies and people. These complex issues are unique for the Oceans and Coasts branch of DEA and therefore, the up-skilling opportunities need to be tailored to meet these challenges and fulfil the knowledge requirements of the 'key areas' that ScientistG1 noted. It should also be noted that these issues are of a material-ecological nature and thus will be discussed in more detail in Chapter Six.

5.4.2 The constitution and enactment of up-skilling opportunities via relatings

The relatings at an organisation like DEA are numerous and some of the relationships are closer than others. Partnerships that stood out were Oceans and Coasts and WWF, when it comes to the MPA management training course, or DEA and SANBI, when looking at skills strategies in the biodiversity/environmental sectors. As was mentioned earlier, there are also collaborations between universities and DEA and in this way researchers in the organisation can further their education through post-graduate studies. In DEA's Strategic Plan document for 2015/16 - 2019/20, the strategy map mentions a strengthened knowledge, science and policy interface and this could be thought of as one of the driving factors influencing the relatings in Oceans and Coasts.

Power in the social space

In most workplaces, there will be aspects of power at play and certain hierarchies in larger organisations especially, can influence what up-skilling opportunities and practices are enabled or constrained. In the group discussion it was mentioned that if an individual wants to attend a course or take part in some form of further training, they go through their supervisor and then the HR department. This approach had been discussed in the monthly meetings held at Oceans and Coasts and it had been agreed that "the organisation and the staff both benefit from training" (ScientistG1). The social space in which these practices take place is an essential component to consider and the power that particular people or departments might hold can have substantial effects on the practices that are available, or that are taken up. Habermas (1972) referred to 'work and power' and much of the work by Kemmis and colleagues on practice architectures drew on this concept as well as Bourdieu's notion of 'habitus' (see Section 3.3.1). By defining the settings in which a practice takes place, more can be learnt about the 'players' that are involved (Kemmis 2005). An institution like DEA is of particular interest in this regard as they are a government department that would be directly influenced by national politics and policy changes. The 'trickle down' effect to other organisations that work closely with DEA, or the people and their professional relationships, also needs to be kept in mind and there might be negative impacts on the associated up-skilling opportunities and practices.

Conferences, collaboration and certification

When talking about conferences in the group discussion, ManagerG2 remarked how conferences are important to meet people who are doing a similar job, or who are in the same field. In this way, links can be made with other organisations or institutes and it opens doors for possible collaborations in the future. The topic of the Sector Education and Training Authorities (SETAs) was then broached and it was established that DEA used to have stronger ties with the CATHSSETA but at the time of the meeting, it was only really for accreditation purposes that they were in touch with the authority. With regard to the certification process, ManagerG3 said: "from our side, we make sure the courses or the training that we are offering… that it needs to be an accredited training. Now we are trying to accredit the MPA training through NMU." ManagerG1 went on to explain how when the authority was still THETA (the Tourism Hospitality and Education Training Authority) they

worked more closely (but this was also when DEA was DEAT – Environmental Affairs and *Tourism*). He said DEAT used to have meetings with the various stakeholders who were relevant on a project or initiative and representatives from THETA would attend which he found to be very worthwhile. It was discussed that something similar could be done in the marine sector and this would be a beneficial platform to share training opportunities and skills requirements.

Another aspect of collaboration can be found in the Annual Performance Plan document (2017/18) which makes mention of partnerships under the sub-title: Internal Environment Factors Impacting Strategy Execution and Performance of DEA. It states:

> The Department is also working on building and strengthening partnerships with different sectors of society and key stakeholders, including international donor organisations. These collaborations and partnerships are aimed at ensuring that in addition to working together towards common goals, we also ensure that the funding of environment and sustainable development programmes and intervention is not only reliant on public funds but other funding models are explored and optimised. (p.5)

This subject of funding is considered further in Chapter Six but the discourse around partnerships and working together is noteworthy here as it reflects the approach to collaborative relationships that the Department, as a whole, aims to develop and strengthen.

The relatings in and around an organisation such as DEA and its Oceans and Coasts branch, are complex but critical to understand when investigating the up-skilling opportunities and practices. In the space of this research, a full grasp of all the various relationships within and outside of the branch was not entirely possible but from what was found, it can be seen that there are positive approaches and attitudes to up-skilling, training and human capacity development present. While this is the case, there is also room for improvement in the marine sector and the Oceans and Coasts branch of DEA.

5.5 Case study four: SANBI

The Marine Programme at SANBI is run by a small but dedicated team of staff, who advise a number of government departments, one of whom is the Oceans and Coasts branch of DEA. SANBI, thus have a national influence on the biodiversity sector and in particular the marine sector, as well as a significant role in facilitating human capital development (see more details on this in Chapter One, Section 1.7). As was reported in Chapter Four, I interviewed

the Marine Projects manager who had also attended Observation V.2. Unfortunately the individual who runs the entire programme at SANBI, the Marine Programme manager, was not available for an interview but had attended and presented at both Observations V.2 and V.3 (SAMSS and the MPA Forum). The document that was included for this case was a report on the MPAs of South Africa and three peer-reviewed papers were included as data, as well as one book, entitled *Guidelines for Offshore Marine Protected Areas in South Africa*.

5.5.1 The constitution and enactment of up-skilling opportunities via sayings and doings

Available opportunities

SANBI has a broad mandate to monitor and report on the state of biodiversity in South Africa and ManagerÉ1 made the point that most of the training or up-skilling opportunities are for the biodiversity sector, rather than for the marine sector in particular. She was of the opinion that because the marine unit at SANBI is so small "they would never have something that is marine specific, unfortunately" (ManagerÉ1). This shows how skills need to be transferrable in many ways and a marine professional is expected to adapt the skills and knowledge they have learnt in one situation, or context, to the marine or coastal context. It also links to the importance of experience for marine professionals and in ManagerÉ1's case, this was in the form of a doing where she went to Marion Island for a year after her Honours and worked as a field assistant on other projects based on the island (see the publication relating to Marion Island under Section 4.4.1.). She also had experience working in the Animal Demographic Unit at the University of Cape Town, doing data capture. Work experience like this contributed to her getting the position in SANBI's Marine Programme and was considered one of the inputs of the science career ladder that SANBI uses to evaluate their staff. ManagerÉ1 explained that factors such as one's formal qualifications and years worked in the relevant field are measured as inputs; while outputs include scientific papers published, number of citations, and taking part in human capital development activities such as supervising interns or students. These doings could indicate a more structured approach to up-skilling at SANBI and ManagerÉ1 suggested this is the approach that the government departments often have. In the case of DEA – Oceans and Coasts, the above could be linked to the approach of sending staff on short courses as a form of up-skilling which, as was discussed, has been recognised as a valuable, yet is potentially only a short-term solution to the skills demands in an organisation (DEA 2010). Another similarity to Oceans and Coasts is that ManagerÉ1 said training is "identified on a person-to-person basis" and that the

managers of the section will motivate for certain staff to go on specific training courses or programmes. This seems to be a common strategy in marine and coastal organisations and may be due to the size and scope of the marine programmes and projects.

One of the projects the Marine Programme at SANBI are very much involved in, is the Offshore MPA Project and the document that was analysed for this case study was the Summary Report published in 2011. The subject of the report was: Systematic planning to identify focus areas for offshore biodiversity protection in South Africa. The report lists a number of 'Project Activities' and gives an idea of the wide scope of skills required by the marine professionals. Some of these activities are listed below:

- Ongoing stakeholder engagement to produce maps of industry activity
- Research of case studies to assess potential effect of Offshore MPAs and identify key lessons from elsewhere
- Research to support effective compliance
- Development of spatial planning framework
- Discussion and review of results. (Sink et al. 2011, p.2)

This extract from the report provides only a few examples of the kind of capabilities that are necessary for the individuals involved and the importance of collaboration is also clear. This point is discussed further under relatings, below, but it should be noted that the marine professionals at SANBI need fairly complex or diverse skills and knowledge. Thus, the learning or up-skilling opportunities available to them would greatly affect the efficacy with which they can carry out their work activities. Further knowledge and skills that may be required can be seen in the titles of the peer-reviewed papers, such as the 2013 paper: 'Systematic marine biodiversity plan for the West Coast of South Africa' or the paper from 2005 entitled 'Biogeographic patterns in rocky intertidal communities in KwaZulu-Natal, South Africa'. These papers also reveal how the marine ecosystems influence the kinds of skills and knowledge the professionals would need and such an intricate relationship with the marine/coastal environment has consequences for up-skilling which are explored in Chapter Six.

5.5.2 The constitution and enactment of up-skilling opportunities via relatings

In terms of relationships, SANBI has close ties with many other organisations but primarily they report to DEA. Being a rather small branch of SANBI, ManagerÉ1 said that in the Marine Programme they have to be "very strategic in the way in which we work" and they focus most of their attention on the national biodiversity assessment, which they are

mandated to do by DEA. ManagerÉ1 described it in this way: “We are the 'baby sister' of DEA but we are not free to interject on every decision”. This is a good example of a relating where power plays a critical role and as was discussed for DEA; the way in which power presents itself or influences relationships and the social space, can be a determining factor for up-skilling practices in the workplace.

Conferences and collaboration

SANBI also work to some extent with SAEON (the South African Environmental Observation Network) but ManagerÉ1 explained it is “more in a data sharing and collaboration capacity”. This is a worthwhile relating in that marine organisations or branches often need to work together on research projects or marine issues in order to maximise the usefulness and relevance of the findings or recommendations. Such relationships/ collaborations might be formed at conferences which ManagerÉ1 mentioned as being valuable networking opportunities. She made the point that:

> Learning about what other organisations are doing is very helpful because then at a later stage, when something comes up as a priority for us, then you have it in the back of your head that somebody was doing that… (ManagerÉ1)

This also contributes to avoiding the situation where time, money and human resources might be wasted on doing work or research that has already been done by a different organisation. Once again, the emphasis on communication is apparent and conferences present a beneficial platform where constructive communicating can take place for marine professionals.

5.6 Case study five: CapeNature

As the conservation agency for the Western Cape Province of South Africa, CapeNature has a broad mandate, but this includes a branch entitled: MPAs, Islands and Estuaries, and I conducted a semi-structured interview with the manager of this branch. The same manager had attended Observation V.2, the Southern African Marine Science Symposium, and the document I drew on for CapeNature was their Human Capital Development strategy, as outlined in Chapter Four. The Human Capital Development Strategy aims to provide “alignment to the broader conservation sector’s human capital development initiatives” (p.3). It is also a tool to assess whether CapeNature is making progress towards human capacity development and transformation. Insights from this document and the peer-reviewed papers listed in Section 4.4.1 are included below.

5.6.1 The constitution and enactment of up-skilling opportunities via sayings and doings

Available opportunities

As an entry point for discussing up-skilling opportunities, we spoke about the MPA management training course (run by DEA, WWF and experts consultants) and who, in an organisation such as CapeNature, would benefit from taking part in the course. ManagerB1 suggested that anyone from the marine field rangers and conservators to the marine managers or even regional managers should attend this training, due to the fact that many of these individuals in CapeNature have a terrestrial background. He said the opportunity to learn about the unique challenges associated with the marine, coastal and estuarine environment would be extremely useful and went into detail about how, when he receives CVs and job applications for marine job postings, they seldom include any marine experience, or if they do, it is very little. This discourse suggests there is a great need for the MPA management training course and ManagerB1 believed the training could address a lot of gaps in the skills and knowledge of the staff. For this reason, he would ideally like to send about ten of his staff on this course and said it would also be worthwhile if the training included a case study type scenario, "where they can look at the regulations of a MPA, to get up on their legislation side of things" (ManagerB1) ('they' being the participants). He went on to say that this issue of legislation around MPAs is a weakness among the employees and considering that this is one of the main objectives of the marine branch of CapeNature, it is vital that the individuals involved are well-informed and understand the implications of the relevant policies and laws regarding the management of MPAs.

ManagerB1 conducted in-house training for the staff in his section, reiterating that most of them "come through the standard conservation courses which are terrestrial and then they have to learn marine" (ManagerB1). He explained that the training is structured in a similar way to the WIO-COMPAS certification training which aimed to bring the participants up to a certain level where they can communicate effectively with scientists. This 'doing' emerged from a discussion around the MPA Forum that formed Observation V.3, and how scientists could share their research findings at this Forum. However, the official WIO-COMPAS training did not take hold as part of CapeNature's HCD strategy (even though there was initially interest in running it there) due to it not being embedded anywhere at the organisation and was thus not taken very seriously, according to ManagerB1. A saying of interest was that, in ManagerB1's opinion, quite a few of the more senior staff at CapeNature

as well as other organisations might be reluctant to do certain courses, because it would reveal how little they know and they would have to admit that their skills and knowledge have been inadequate until that point. This is related to an individual's pride or character, and is discussed further in the relatings section of this case.

The HCD Strategy of CapeNature does not list any specific opportunities for skills development/training for the managers or employees of the organisation, but it does identify a number of core principles that form sayings worth mentioning. One such principle is stated as being:

- People have unlimited potential and are the most valuable asset to CapeNature - whose talent should be attracted, developed and retained in a strategic manner and aligned to Employment Equity and transformation principles. (p.10)

Prior to this, it also considers the key drivers of HCD in the organisation and outlines the need for *more* skills, more *equitable* skills distribution, and *new* skills (emphasis added). These sayings suggest what the priorities of the organisation might be and although not explained in more detail, the sense one gets is that CapeNature is striving to create an enabling environment for skills development and learning in the workplace. Furthermore, the strategic objective I found relevant to up-skilling in the document stated how CapeNature aims to implement "comprehensive reward, recognition and talent retention initiatives to enable the effective retention of key skills and talent in line with the organisational requirements" (p.18). This objective, in theory, would be linked to the available up-skilling opportunities and something like sending staff members on the MPA management training programme might be considered an 'initiative' that could contribute to this objective.

What makes a good manager?

Management skills in a marine or coastal organisation like CapeNature are unique due to the nature of the work and the specific physical space-time in which the work and activities take place (drawing on the four-planar social being and practice architectures by Hemmings et al. 2013, see Chapter Three). When asked what an ideal manager would look like ManagerB1 said: "The best manager you can have is scientifically trained that can manage, that is the best package" and went on to give examples of people he believes have found this balance and have therefore succeeded. One example was the director of SAIAB who I interviewed for that

case, ScientistÄ3. In many ways, ManagerB1 himself would be another example of a manager that has successfully crossed the science and management divide. He thinks that a scientist should also have management skills, for the times that they need to manage interns or communicate with the public. He described a freshwater scientist he knew, who has learnt to communicate in such a way that he finds out what is important to the public, as well as the relevant management entities, and then considers the research that is appropriate for the situation. In ManagerB1's words: "He's got people skills so he can talk to people, he can identify important things, bring it back and plug it into science". This could be reversed to describe a good manager too; one who will seek out the science or research that is relevant to the problems they are facing on the ground. Examples of such problems and the specific topics being dealt with can be seen in the titles of the peer-reviewed papers and book section that were listed in Chapter Four and which are listed here again:

- Aspects of the biology and ecology of the Orange-Vaal largemouth and smallmouth yellowfish in the Vaal River.
- Status of the Orange-Vaal largemouth yellowfish, *Labeobarbus kimberleyensis* (Gilchrist & Thompson, 1913).
- Estuary Management in South Africa – An Overview of the Challenges and Progress Made to Date. In: Estuaries: A Lifeline of Ecosystem Services in the Western Indian Ocean (book chapter).

5.6.2 The constitution and enactment of up-skilling opportunities via relatings

Networking and conferences

The fact that I initially met ManagerB1 at the conference that made up Observation V.2 is a notable relating to begin with and he had some background knowledge of the aims and objectives of this research from the presentation I had given at the conference. This framed his comments on conferences to some extent and it was understandable that he considered conferences a meaningful way of networking. He felt managers should be encouraged to attend conferences such as SASAqs[11] and SAMSS, for the reason that, as a manager, you can then "put your priorities out there and motivate for them [to be researched]" (ManagerB1). He also commented: "Conferences are incredibly important, important for young scientists, to share their ideas and get checked and queried". With regard to marine managers attending

[11] SASAqs stands for: Southern African Society of Aquatic Scientists.

conferences he says: “That’s where there’s a big gap”, and he thought that budget should be made available for managers to attend conferences, believing that networking is key, “the way to go” (ManagerB1). Similarly to what the SANBI marine professional said about going to conferences, ManagerB1 also said managers and scientists need to attend conferences “so you meet other people and know who else is doing what” and he considered this networking of crucial importance.

DEA, leadership and forming relationships

We spent some time discussing the structure of DEA and how the department works, how it could work better and how they work with conservation organisations. ManagerB1 described the Oceans and Coasts branch as being made up of three sectors: management, research and law enforcement. He went on to say that within these sectors, different training is required. For instance, you would not send the chief scientist on EMI (Environmental Management Inspectorate) training as he or she is not directly involved in law enforcement. “So it’s about specialist training” (ManagerB1) and what is needed is for the director to pull the different sectors together so that the employees engage with each other and learn how to work together. ManagerB1 believed that “there is capacity dotted around” but without good leadership and communication, Oceans and Coasts is not functioning as it should be.

The relationship between CapeNature and Operation Phakisa is not a direct one and although ManagerB1 represented CapeNature on one of the Working Groups of Phakisa, it is more an advisory role and he explained that DEA, SANBI and SANParks are more involved in the deliverables for the initiative. In terms of other relationships, however, ManagerB1 worked with many of the other conservation agencies in South Africa because of his background and experience in estuarine management. He also pointed out that the MPA Forum was designed in order to bring together managers from the different conservation organisations so that they can collaborate and form beneficial relationships between agencies. The MPA Forum, to ManagerB1 is also for sorting out the “nitty-gritty”, as he called it, which I interpreted as being the more technical, day-to-day activities and challenges faced by the marine, coastal and estuarine managers.

These relatings are influenced by the personalities involved and ManagerB1 gave the example of a scientist from ORI (not one of the individuals that participated in this research) who was a fisherman at heart, and who formed relationships with the fishermen on the coast and then gets them to work with, and for, him. ManagerB1 commented that "that's an incredibly important skill; there are different skills and that's not a management skill, that's a communication skill [related to his] attitude [and] character". A similar concept was mentioned earlier in the ORI case study narrative, where the issue of having the right personality traits and the *will* to communicate your research as a scientist, come through as being important. The question of where or how you learn this was presented and once again I found the question arising: Where does an individual learn or develop the appropriate attitude towards forming relationships that facilitate mutually beneficial management strategies? Or how do you learn effective communication skills as a marine manager? These questions are deliberated further in Chapters Six and Seven.

5.7 Case study six: WWF – Marine programme

As was reported in Chapter Four, the senior manager of the Marine Programme at WWF participated in this research and one document was included for analysis. As a prominent conservation organisation not only in South Africa but also globally, WWF was an obvious choice as a case study for researching the up-skilling opportunities and practices that occur in the sector. In South Africa WWF also plays a crucial role in the MPA management training course that has been mentioned previously, as well as the MPA Forum, which is organised by WWF in collaboration with DEA – Oceans and Coasts.

5.7.1 The constitution and enactment of up-skilling opportunities via sayings and doings

WWF approaches skills development through individual development plans that include key performance areas or KPAs, and potential training courses. Individuals would discuss with their manager the specific KPAs, milestones, and targets in their development plan and from there, identify the action needed. ManagerH1 explained that when putting together this development plan one has the opportunity to put forward which courses one may want to do and if one motivates to one's manager, and they agree it is an appropriate course, then one is expected to follow through and attend the course or event. He siad it is the manager's responsibility to check if the individual ends up making use of the opportunity or not.

Available opportunities

Two examples of training courses that might be put forward were mentioned: a course on environmental policy or a fish identification course. But when it comes to MPA managers, ManagerH1 said they are "moving away from technical, need to know what something looks like [type knowledge] and it's more about management processes" and with regard to up-skilling, he explained: "we try to keep doors open and opportunities open, recognising how flexible you got to be, to actually achieve our outcomes" (ManagerH1). This brings out the aspect of adaptability that was mentioned in the SANBI narrative, and highlights how the skills required may change over time, in different organisations, or at different stages of one's career. It is probably for this reason that when talking about training courses, ManagerH1 said: "it's not always clear which ones you should do, which are good" and he added: "but that's not specific to marine…"

The opportunities at WWF include in-house workshops that are organised on an ad hoc basis and ManagerH1 pointed out that these are often more focused on management rather than science but the research they include needs to feed into their management objectives and goals. He said that other organisations will sometimes circulate relevant articles and they find out about any other available up-skilling opportunities in a similar manner. When asked if there are enough opportunities for marine professionals he said yes, but "there's a shortage of time" (ManagerH1). The issues of available time and financial resources are discussed in Chapter Six but it is important to assess whether the opportunities are available in the first place. In this regard ManagerH1 said that "it's not always clear what the opportunities are" but that one reason managers should attend the MPA Forum is to find out more about what opportunities are out there as: "The whole point of the MPA Forum is, to some extent, to help share what is available" (ManagerH1).

An interesting 'doing' that ManagerH1 mentioned is that of a sabbatical-type opportunity that WWF offer to their staff. This involves the individual taking two months off to take part in "personal development opportunities or a course" (ManagerH1) that relate to and benefit their work. It allows for time to reflect on the work they do in the organisation and what challenges they face in their working lives. This approach may not necessarily be possible at all marine organisations in the country, but is a structured, yet effective way of allowing the employees in an organisation to stay motivated and committed to the biodiversity sector. Another course

that WWF run, together with industry, is a Responsible Fisheries Training Course which runs over two-days and is aimed at skippers, crews, and FCOs (Fishery Control Officers). ManagerH1 commented that the participants of this course are generally very interested in learning and the opportunity is a valuable one.

Work experience vs qualifications

When discussing university degrees and formal qualifications ManagerH1 clarified that to him, a university degree is not a necessity for an employee but that "if someone's got people skills, you can make anything from him, I think" (ManagerH1). He went on to say: "Our focus is much more on enabling people in that sense, rather than the technical…" and he gave the example of the ORI staff who are passionate about their work and he believed this is more important than formal qualifications. Another example is one of the individuals in WWF's Marine Programme who has nine years of work experience in the seafood trade industry and although 'on paper' he doesn't have the technical expertise, he has valuable contributions to make to the team. This individual works on the Seafood Market Transformation Programme, which falls under the Marine Programme of WWF. An emphasis on work experience is not unique to this organisation but it must be noted that in other circumstances formal qualifications are a requirement and on many occasions both a university degree as well as work experience is called for. This is not always an easily achieved situation and the opportunities for gaining experience in the field need to be present and accessible for individuals hoping to work in the biodiversity sector.

In the document that was analysed for WWF, the sayings surrounding formal training for mid- to senior career professionals include part- or full-time studying in longer term programmes such as doing a degree, or certified course, but it also states that this may mean extended periods of time away from the workplace. The document also suggests short courses to address specific skills development needs, or work integrated learning. The discourse of 'skills gap' is also present in the document and it suggests creating a profile for each employee relative to their job and competence profile. This is in line with what was discussed with ManagerH1, about individual development plans and the document lists various aspects of the individual that would be considered. These include academic qualifications, curriculum vitae, work experience "and competence gained through key work areas over time" (p.27), as

well as “personal and professional attributes; employee self-assessments; and performance appraisals” (p.27). The document goes into detail about how the skills gap should be addressed and emphasises its importance. In general, this document correlates with what was found in the interview and the workplace skills plan seems functional for WWF, at least in the Marine Programme.

The peer-reviewed papers from WWF’s marine programme highlight how much of their work revolves around fisheries and MPAs, but also on specific topics such as certification or misnaming of fish species. The 2014 paper regarding MPAs looks at how they are being managed, while the earlier paper published in 2008, deals with traditional line fisheries in particular. These papers provide a snapshot of the complex and unique issues that an organisation like WWF-SA is responding to and the marine professionals involved need to be well-equipped to face these challenges. This can also be related back to ManagerH1’s comment about flexibility and the need to keep doors open when it comes to up-skilling opportunities. As with most of the other cases, there were multiple authors for these papers, which illustrates the essential role collaboration plays in these organisations and that the relatings between researchers and/or managers are vitally important.

5.7.2 The constitution and enactment of up-skilling opportunities via relatings

The relatings in WWF’s Marine Programme are centred on the fact that WWF aims to play the role of an organisation that can ‘bridge the gap’ between science and the practical, day-to-day realities of the “outside” world[12], be it management of MPAs, government policy and procedure, or public awareness of marine issues. WWF want to translate the science and marine/coastal research into something useful and they also try to play an intermediary role between DEA and expert consultants (the MPA management training course is an example). In this way, they help to mediate between the more structured institutional government departments and other organisations.

[12] In the past, science and research have had a reputation for operating outside of the world of practice, which creates a narrative of science being somewhat separate and removed from reality, and to a certain degree this still persists.

Working with partners

WWF "rely on partners when it is necessary" (ManagerH1) and in some instances this might involve a university such as University of Cape Town, or a research institute, like ORI. For certain projects or initiatives run by the Marine Programme, they require collaboration with other organisations and one example is the Southern African Sustainable Seafood Initiative (SASSI). This initiative aims to educate those in the seafood trade, everyone from the wholesalers and restaurants through to the seafood-consuming members of the public, about what sustainable seafood is and which species of fish or shellfish are under threat from overconsumption or unsustainable harvesting practices. When assessing the species, the skills, knowledge and information required will often come from outside WWF and ManagerH1 said they rely "heavily on partners and the SASSI assessment process is a perfect case in point". This brings into focus the importance of communication once again and how through specific relatings, we can consider how the up-skilling opportunities and practices are affected by communication skills and the ability to form beneficial relationships in the marine sector of South Africa.

Personal inspiration and motivation

We discussed the role that other people have played in ManagerH1's career and if he felt that he had any mentor-type figures in his working life. He named a professor from UCT who was not an official mentor but who ManagerH1 found to be a role model and who exposed him to the fundamental ideas behind conservation and managing, or working with, people. ManagerH1 considered this professor to be a major influence in his career and commented: "He's always been very inspirational for me." ManagerH1 also mentioned how he drew on the motivation of the managers that work under him saying: "I take motivation from their motivation and their inspiration, and their interest in you." This aspect of taking interest in the marine professionals around you is significant and might be the key to learning effective communication and management skills. ManagerH1 concluded the discussion with: "I think that that's a key part of bringing people into the sector and keeping them in the sector"; this comment is noteworthy as the idea of retention in the biodiversity sector was one of the incentives for conducting this research into up-skilling (see Section 1.4: Research Goals). Thus, it can be said that the relationships, or relatings, in these organisations and workplaces have substantial sway when it comes to the commitment and passion that marine

professionals show and this influences the pursuit of learning and up-skilling opportunities or practices in these workplaces.

5.8 Case study seven: SANParks

Being the largest conservation agency in South Africa, it was crucial that SANParks were included as a case study in this research and, as was outlined in Chapter Four, two staff members from SANParks were interviewed. Firstly, I spoke with the national marine coordinator who came from a science background and was responsible for collating scientific information and drafting management plans. I considered her a 'scientist' although she plays an important part in the management of marine and coastal parks as well. I then got in touch with and interviewed a manager who was in the position of senior section ranger at the time. More details can be found in Section 4.4.1 of Chapter Four and there I also mention the strategic plan that was sourced as a document for SANParks. The observations conducted did not include either of the participants but other SANParks staff were present at all three observations.

The Five Year Strategic Plan (2014/15-2018/19) for SANParks was an extensive and detailed document that included key insights into the approach the organisation takes to skills development. In one instance, a strategic planning outcome of having a "skilled and capable workforce to support an inclusive growth plan" (p.14) is described under the section: Performance Environment. Elsewhere, the document discusses the National Development Plan and includes the aspect of improving education, training and innovation. The details of this section are picked up again later in the description of this case study.

The perspectives gained from the marine coordinator, ScientistÇ1, and the senior section ranger, ManagerÇ1, differed in many ways but there were also overlapping topics that came up in the semi-structured interviews with them. These commonalities will be discussed at a later stage but I will explore the findings in two separate sub-sections for each interviewee, starting with ScientistÇ1.

5.8.1 SANParks Marine Coordinator: ScientistÇ1

5.8.1.1 The constitution and enactment of up-skilling opportunities via sayings and doings

Discussing her background and her doctoral research, ScientistÇ1 commented that the PhD gave her "the scientific backing… but the post that I'm in now, it's more of an administrative [role]" and she agreed it's not really a manager role but includes working with management decisions. She described the 'doing' as being one of facilitation: "What I do in this job, is I facilitate; so I get outside clients to do the research and then I interpret it and decide what can come out of it for management decisions and planning" (ScientistÇ1). The impression was that she did not go through any formal training for this role but learnt from others and through everyday experiences. When asked what kind of courses she might attend her response was: "I don't have financial or management [experience], so I'd motivate to go on a financial skills course or whatever" (ScientistÇ1). When returning from a training course or skills development opportunity there is no formal structure in place for reporting back on the opportunity in the marine section but ScientistÇ1 explained that there would most likely be the scenario of having an "informal chat over tea" (ScientistÇ1), or something similar. I propose that these situations are often as valuable and meaningful as formal reporting mechanisms and will usually result in an honest account of whether the training was worthwhile or not.

The peer-reviewed papers published by ScientistÇ1 included a paper published from her doctoral study and two more recent papers dealing with commercial fisheries in South Africa. The focus on commercial fisheries (and in the 2014 paper, the inclusion of marine-spatial planning) hints at the mandate of SANParks and the role that this organisation plays as the largest national conservation agency in South Africa. As was the case with WWF, these publications were authored by a team of researchers and ScientistÇ1 would have had to work together with the co-authors on these papers. The trend of collaboration between researchers is apparent when considering the peer-reviewed papers for the various cases and for the marine sector of South Africa, these relationships between organisations and researchers are crucial.

Managers and the MPA Forum

One approach I used to discuss skills and training in relation to managers was to ask about the possibility of managers moving between parks and even between organisations. This approach stemmed from the issue of managers being transferred from terrestrial protected areas to MPAs, which was a challenge that I became aware of during the contextual profiling phase of this research. ScientistÇ1 agreed that "a lot of them come to marine parks with no marine experience whatsoever" ('them' being the managers) and then, "they don't fully understand the environment" (ScientistÇ1). She commented on how most of the managers do not come through the "conservation ranks anymore; they come through tourism; they come through admin" and a determining factor when it comes to training or capacity building in the marine section, is the senior manager of a park. ScientistÇ1 said: "Well, I think it depends on your manager of the park… How much they value the marine skills and how much the [senior] park manager knows about the marine…" This is possibly where the MPA Management Training Course and the MPA Forum have a role to play and if an organisation is willing to send their staff to these events, the benefits for the marine sector will be seen. When discussing whether the purpose of the MPA Forum is to disseminate science and research or to provide a platform for MPA managers to share challenges and solutions, ScientistÇ1 suggested that the Forum went through cycles and "it depends on what the issues are [at the time]" (ScientistÇ1). The other requirements for a marine manager are to have completed firearms training and have done a skipper's course, which ScientistÇ1 said are "quite important in terms of the management staff because if you don't have those things then you can't fulfil your duties". This type of training is expected at a manager level, but if there is a field ranger who shows potential and who satisfies the equity requirements, SANParks will facilitate the required training in the hope of the individual taking up a management position in the future.

5.8.1.2 The constitution and enactment of up-skilling opportunities via relatings

ScientistÇ1 described how when she started with SANParks she did not have much experience with the administration side of the job but there was a welcoming and helpful attitude among the other employees. She said: "I think coming into the SANParks family helped a bit" (ScientistÇ1) and that at the time, SANParks were focusing on adaptive planning and had drawn up management plans which assisted her in understanding her responsibilities and what was expected. I would speculate that the idea of being part of a

‘family’ is unusual for a large organisation but maybe this is due to the fact that the marine sections of these organisations are generally smaller and thus, the employees work more closely together. This atmosphere would also influence the process of identity formation of the individuals in the workplace and as was discussed in Chapter Two, this aspect of agency is connected to professional practices (Billet & Pavlova 2005) and one can consider how these identities will affect the relatings that pertain to up-skilling.

We also explored the relatings to other organisations and ScientistÇ1 explained how SANParks has a close relationship with a number of universities such as Rhodes University and the Nelson Mandela University. However, the same can be said for SANParks and SAIAB, SAEON and Bayworld, which is the aquarium in Port Elizabeth that has a research section. DEA are also SANParks’ parent body and ScientistÇ1 reports directly to DEA, as was the case for SANBI and the marine team there. These reporting and research relatings are influential in terms of the skills that are required by the individuals involved and as ScientistÇ1 pointed out, at Addo Elephant National Park there is so much concentrated research going on in Algoa Bay and surrounding areas and the SANParks managers are very fortunate in this regard. ScientistÇ1 played a key role in bringing the researchers and managers together in the form of an annual meeting where research projects are presented and the managers have the opportunity to ask questions or give their input.

5.8.2 SANParks Senior Section Ranger: ManagerÇ1

5.8.2.1 The constitution and enactment of up-skilling opportunities via sayings and doings

Skills diversity and biodiversity

The skills requirements for a manager at SANParks are complex and diverse due to their having to deal with multiple aspects regarding the day-to-day running of these protected areas. ManagerÇ1 explained further, saying they had to cover four main areas of concern which are: law enforcement, infrastructure maintenance, social aspects such as the surrounding communities, or communicating with the public and biodiversity/conservation issues. He mentioned that they are “biased towards conservation; it is our biggest mandate” (ManagerÇ1) and that through having biodiversity knowledge as a priority, they have a united team who share a common goal and mindset. The conservation or biodiversity aspects include activities like basic monitoring or assisting scientists with recording data (not necessarily for senior managers but for the more junior field rangers). Examples of

infrastructure maintenance are fixing boats and jetties on the islands and maintaining the generators or desalinating equipment, all of which are expensive and valuable pieces of equipment or infrastructure. So when it comes to hiring staff, ManagerÇ1 said it "depends where we lack, as we lose an enforcer then we'd like to replace him" but that it is "very difficult to find someone who can do all four" (ManagerÇ1), meaning someone who has the skills set to cover all four areas of work in the park. Here, we were discussing skills at more of an entry level but in terms of managers, ManagerÇ1 commented that the MPA management training course was invaluable when it was run over multiple weeks and even in its current form, he believed anyone involved with MPAs should attend that training.

Further Training

Senior rangers or managers are sought after by the various conservation organisations in South Africa and ManagerÇ1 gave an example of a SANParks ranger who gained two years of experience at Tsitsikamma National Park, but then left for one of the top positions at Eastern Cape Parks and Tourism Agency. For this reason, SANParks almost considers training as a risk because if they invest in an individual and that person leaves, they have essentially 'wasted' time and resources. However, ManagerÇ1 said it is not difficult to progress through the ranks at SANParks and become a senior ranger or manager if you find someone committed and passionate about the job. He said it takes "years of experience and added training" (ManagerÇ1), but it is quite possible. This additional training could be in the form of the following doings: skipper's training course, law enforcement training, hand-to-hand combat, or firearm competency training. Other opportunities that would be recommended in the early stages of a career are health and safety training or first aid courses. ManagerÇ1 also emphasised the importance of being able to swim if one works in the marine section, as well as being physically fit and he said SANParks is one of the few conservation agencies that include a fitness assessment, even at the interview stage.

When asked if he thought there are enough 'trained' marine professionals to choose from, as it were, he responded: "there's not a big enough pool and it's not the target group" (ManagerÇ1). By *target group*, he was referring to the equity requirements (discussed in more detail under relatings, in the following section), as well as the necessity of finding someone who is both passionate and committed. He explained by saying:

> There might be a big pool of people with a paper qualification, but when you tell that person: look, you've got to go out there and there's no over-time, and there's no… whatever; I expect that person to go happily. I would. And I did. (ManagerÇ1)

We went on to speak more about his experience prior to joining SANParks and how he had always been passionate about fishing, had done his divers qualification and felt strongly about conservation. Again, this brings in aspects of an individual's character or their attitude towards their work and professional life and as ManagerB1 from CapeNature made clear, these are crucial factors for managers and how they approach their work, skills development and commitment to the marine sector.

5.8.2.2 The constitution and enactment of up-skilling opportunities via relatings

Skills and equity

In the light of the skills that were discussed in the previous section, one can imagine that the relatings are varied and extensive for an organisation such as SANParks. When looking for candidates to fill an open position in the park, ManagerÇ1 said they considered individuals who had been in the South African Navy and the SAPS (the South African Police Service), as well as individuals with a science background but none of them knew very much about the conservation of marine species, such as penguins, or how to analyse fish stocks. This process was further complicated by the fact that the candidate needed to be a Black woman. The subject of employment equity came up regularly over the course of the interview and although the focus was on training and skills development, it soon became apparent that the link between up-skilling and the issues surrounding transformation and race could not be disregarded. ManagerÇ1 explained: "If you look at our organisational structure we are meeting the equity perfectly, and in some places, for black women, we are exceeding it…" However, he went on to say that this is only if one considers total numbers and it is not the case if you look at individual sections or different career levels. In the marine section, in particular, there is a lack of Black women (*Black* in this case includes Indian or Coloured), and ManagerÇ1 described this gap by saying "for us, at SANParks, it's in our conservation department". This presents a challenge that not only managers must deal with, but which also affects the potential employees, who apply for the positions in the organisation. The implications for up-skilling opportunities and practices are widespread when considering employment equity in conjunction with skills and knowledge, but if one looks at how this issue fits into practice architectures, it is clearly part of the social-political arrangements that

make up the relatings (Hemmings et al. 2013). There are also associations with power and the socio-material and this will be explored further in Chapters Six and Seven.

The topic of equity is also mentioned in the SANParks document that was included for analysis in this research. It states that there is a need to "interest young Black South Africans into the conservation field" and this need is related to "ensuring that there are sufficient skills in the country to contribute towards dealing with sustainable resource management and climate change challenges" (p.20). This transformation agenda is widespread in organisations throughout South Africa but comes with particular challenges in the marine sector. Black Economic Empowerment (BEE) has been a key aspect of South Africa's Constitution since 1995 and it is made clear in the strategic plan of SANParks that they are guided by the principles of BEE and aim to implement initiatives that promote equity in the organisation, at all levels.

Organisational buy-in for training

The problem of 'losing' a staff member while they are away from their job for training purposes was mentioned by ScientistÇ1 but ManagerÇ1 pointed out that "it's not insurmountable if the organisation has bought into it" and he went on to say that if a person is away for three weeks, or even three months, it would be worth it in the long run and he described it as a "gain over five or seven years" (ManagerÇ1). This would require the organisation to either re-structure their staff's responsibilities temporarily, or make allowances for this training to occur in other ways. At the time of conducting the interview, such measures or allowances were not commonly made at SANParks, or at least not in the marine section.

Partnerships

The relationships with research institutes were also touched on and ManagerÇ1 referred to partnerships with SAEON, SAIAB and SANBI, but importantly, the fact that the SAEON offices were close by and that the relevant node did much of their research in Algoa Bay. ManagerÇ1 put the benefits into words as follows: "And as Addo, we're even more fortunate that SAEON is right here close to us, as compared to like Table Mountain or Tsitsikamma, and we can share their boats, we can share their diving [trips], if they've got dive teams…"

This kind of collaboration is essential for conservation agencies and the up-skilling opportunities that arise out of these relatings are critical for the marine professionals within these organisations.

5.9 Case study eight: Ezemvelo KZN Wildlife

The Biodiversity Spatial Planning and Information branch of Ezemvelo KZN Wildlife falls under the Scientific Services division of the organisation and the GIS analyst I interviewed is similar to the Marine Coordinator at SANParks, in that she comes from a science background but interacts closely with the managers of Ezemvelo. Thus I refer to her as a scientist and she would have taken part in Observation V.2, SAMSS, although I did not formally meet her there. The description below is also informed by one relevant piece of documentation, as was stated in Chapter Four.

5.9.1 The constitution and enactment of up-skilling opportunities via sayings and doings

Formal university degrees and employability

As an entry point to talking about up-skilling, the subject of formal university degrees was explored and as ScientistW1 had recently finished a Master's (part-time, while she was working) it was a fairly current topic for her. With regard to doing another degree, she commented: "I think that often happens, you go… and you do that, but then sometimes you over-skill yourself" and she reinforced this by saying: "and then you become so skilled in one area, that people don't always want you in the end because you're too skilled!" (ScientistW1). This concept of becoming 'over-skilled', or too specialised in one area, can be discussed from many different perspectives and relates to salary expectations, the knowledge economy and the mismatch between supply and demand of skilled professionals. Becoming 'over-skilled' can also lead to researchers staying in academia, rather than seeking employment in the relevant sector, which is not necessarily detrimental, but may mean the sector is not benefitting as much as it could be from the individual's knowledge, skills and capabilities. We also discussed the assumption that doing a degree ensures that you get a job and ScientistW1 commented on how people coming into the sector could rather consider getting more technical skills:

> Interns and people coming out of varsity, they think that by getting degrees it's going to get you a job and they don't understand that it's not guaranteed; so sometimes I think getting a skill is better because you can then go into those places that need people. (ScientistW1)

Here she referred to a "skill" as a technical or practical skill, such as being an instrument technician, or doing a divers qualification and the "places" she spoke of are any vacancies that might be open in the sector. However, she also remarked on how few positions there are that are vacant in the marine sector and in Ezemvelo particularly. She explained that the students who take part in the Ocean Stewards programme[13] complete the programme, but do not have options when it comes to marine positions in the various organisations. The same applies to interns that come to Ezemvelo and ScientistW1 said it is difficult for everyone involved because "you put a lot of effort and training into those people, and then at the end, there's nowhere for them to really go… At least they've got the experience, but it's hard. And I think for them too." She continued by saying "we do need more people in the marine field, it's sorely lacking" and she added that if the positions are not available, then "you are up-skilling people for nothing really".

This issue of available positions being hard to come by reflects a larger problem of understaffing in organisations and in particular, the marine or coastal branches of the organisations. The problem may lie more in the structuring of the human and financial resources in an organisation, than the availability of skilled professionals, but this will in turn make the marine and coastal jobs in the biodiversity sector less appealing. The employment offered in many organisations (possibly excluding the national government departments) is often contract work and if an individual is seeking a permanent position, this will probably discourage the person from applying. ScientistW1 herself, was on contract for 11 years and at the time of the interview, she had only recently been given a permanent position, so when asked if she saw herself moving up the career ladder she laughed, commenting: "Now, I actually want to be in this position" but went on to explain:

> I'm in a good place now, in that I'm enjoying what I'm doing and the role that I'm in, because I get to do research; I'm also helping with the MPAs, and the 'cons' planning. So… I kind of see myself [staying] in this position, but maybe just increasing what I'm doing in the position.

[13] The Ocean Stewards programme is run by Ezemvelo KZN Wildlife. It offers third year and Honours students the opportunity to gain experience in the field (i.e. out at sea). In addition, bursaries for further studies are sponsored by Wildlands and Grimrod. In this way, Ezemvelo have been "trying to upskill" (ScientistW1). At the time of the interview, this opportunity was available for students from UKZN and had recently been extended to students from the University of Cape Town and the University of Zululand.

By ‘cons’ planning she meant ‘conservation planning’ and although she felt like there was no higher position to move into at Ezemvelo, at the time, she seemed content to have finally been given a permanent position as GIS analyst.

Working with MPAs

Operation Phakisa included a number of new MPAs being proposed and this meant there was an increased need for planning, biodiversity assessments and communication with the various stakeholders involved. Much of this work was done by ScientistW1 and she explained how she set up forums with the managers and stakeholders. They all met regularly until the MPAs were gazetted by government and now they hold the forums less often.

Communication skills are required in these situations and as has been mentioned before, it is unclear where one might find the up-skilling opportunities that facilitate the learning of these skills. In the following section on relatings, this matter of communication is discussed further. Reporting on MPAs is one of the main functions required of ScientistW1 and she mentioned how the organisation has KPIs (key performance indicators) but due to a changeover of structure and administrative board “they have not really been followed in the past year”. With regard to her reporting on MPAs she said: “I’ve just been working towards that, although we haven’t really been filling in our assessments and checking”. This temporary setback in the KPI system is not ideal, but for individuals who are dedicated to their jobs, it does not seem to have much of an impact. However, it may also cause complications when reviewing skills development strategies or capacity building needs in the organisation and that seems to be the case for Ezemvelo.

Relevant documentation

The Five Year Strategic Plan and Performance Plan (2009-2014) document briefly mentions ‘Learning and Growth’ in the organisation and lists the related strategic objective: “Attract and retain the best Human Capital” (p.45) along with another objective: “Create a culture of learning and development of employees” (p.45). It then referred to a Skills Development Plan but I was unable to source this document from the organisation. Although outdated, the Five Year Strategic Plan and Performance Plan was the most useful when looking for statements regarding skills development or workplace learning initiatives. The more recent documents, namely the Ezemvelo KZN Wildlife Strategic Plan 2015-2020 and the Annual Performance

Plan 2015/16 made little to no mention of human capacity or skills development, so I did not include these documents in the analysis phase of this research.

In addition to the documents mentioned above, there were four peer-reviewed papers that were included as data. Although multiple authors were responsible for these publications, the scientists from Ezemvelo made valuable contributions to the research projects, which included a coastal and marine biodiversity plan for KwaZulu-Natal published in 2012 and the 2005 publication entitled 'Evaluating conditions for successful co-management of subsistence fisheries in KwaZulu-Natal, South Africa'. The most recent paper (2014) dealt with the Phakisa initiative and the associated MPAs ('Phakisa Initiative: fast-tracking establishment of an effective and representative network of Marine Protected Areas for South Africa'). These papers give insights into the work of the marine scientists at Ezemvelo and such large-scale projects require certain capabilities and holistic approaches which the professionals would have to learn or develop in order to be effective in their roles at the organisation.

5.9.2 The constitution and enactment of up-skilling opportunities via relatings

Communication

The relationships at Ezemvelo are often influenced by which department one is dealing with and as was explained in Chapter One, the scientists and researchers employed by Ezemvelo are mostly in the 'EcoAdvice' division of the Scientific Services. This division is responsible for making sure that management decisions in the organisation are underpinned by sound ecological principles and the best available information for the area of concern. In her work in the Biodiversity Spatial Planning and Information unit, ScientistW1 considered herself the 'go-between' person due to how closely she worked with the marine managers but also with the scientists in EcoAdvice. She felt like "there's a pretty good relationship between them" with 'them' being the scientists and managers, but that there are still some frustrations from the managers' side because "scientists are doing the science and then it doesn't always come back to them" (ScientistW1). When asked about the MPA Forum as a possible communication channel, she responded that she thought the MPA Forum was mainly for managers, but that there are other channels for this communication to happen and she elucidated by saying:

> I kind of work across both sectors; so I do the GIS, but then I've also been working with the managers to develop the new Marine Protected Areas so I work quite closely with the scientists at ORI, the scientists here and then with the managers, because they [the managers] give advice on whether the things we want to implement are possible or not, because they are on the ground and they understand the logistics. (ScientistW1)

She seemed to think that these communication skills were learnt through experience and out of necessity, but that she could possibly go on a course or workshop to find out more about dealing with stakeholders, if such an opportunity existed. We also discussed conferences as a platform for scientists and managers to communicate and on this topic she said: "I think more people are realising that we actually need to learn how to communicate with other people, so I think it's been brought into a lot of these conferences now" (ScientistW1) and here she meant conferences such as the symposium Ezemvelo hold annually, the Symposium of Contemporary Conservation Practice, as well as SAMSS (Observation V.2). About communication, she added: "everybody needs that, really… it's a good skill, all round" (ScientistW1) and when asked which other conferences she attended, she noted she had been to a few of the MPA Forums held over the years and more recently has been attending the WIOMSA symposiums.

Significant relationships in the workplace and between organisations

For ScientistW1, an influential person in her career was the head of Scientific Services who was also a respected marine scientist and for many years, ScientistW1 worked under her and would approach her for advice on anything marine related as "she is more involved and she knows the marine stuff more than the terrestrial guys" (ScientistW1). I got the impression that by directly approaching this individual, ScientistW1 felt she received valuable guidance and support and could therefore perform her job more effectively and with better results. The close links ScientistW1 had with the scientists at ORI (mentioned in a previous quote) are also important and relatings such as these influence the learning that takes place for marine professionals and their access to new knowledge. ScientistW1 did, however, express her concern over such collaborative relatings by saying: "I don't think we [are] as close as we should be [with other conservation organisations] and often it's because there is a changeover of people". This turnover of staff she referred to has been hinted at in other cases too and is seen as a wider problem in the biodiversity sector, as is described when considering retention of professionals in the Biodiversity HCDS (SANBI/Lewis Foundation 2010). The

implications for up-skilling opportunities and practices are complex but include challenges such as the organisations perceiving it as a 'risk' when training an individual (as was discussed with the SANParks manager, ManagerÇ1), or the up-skilling initiatives not being aimed at the appropriate skills required by the organisations.

The document previously described – the Five Year Strategic Plan and Performance Plan (2009-2014) – makes an important point under the title 'EcoTourism': "We realise that our people will be our success and we are committed to continuing to empower our staff through appropriate training and development as well as by creating an environment within which they will feel motivated to excel" (p.23). This comment draws attention to the importance of the organisation's commitment to its employees and could be linked to the earlier statement about retaining staff in Ezemvelo. Another relating mentioned under 'Stakeholder Analysis' is the phrase "skills transfer" (p.35) when talking about the private sector and this indicates Ezemvelo's willingness to seek expertise from outside the organisation when considering training and skills development programmes. These insights from the Strategic Plan and Performance Plan give some ideas as to the approach the organisation takes to human capacity development and up-skilling opportunities, but the following question should also be considered: How many of these objectives or sentiments are being actualised in the day-to-day working lives of the employees?

Ocean Stewards Programme

The relatings within the Ocean Stewards Programme form an integral part of the learning that takes place for the students participating, and the opportunity afforded to them is worth mentioning here. Although not professionals, the participants have experiences that very often impact on their career choices and ScientistW1 explained how when out at sea: "a lot of people on board have connections; you can connect the students with the right people so they can go further". This statement can be associated with the concept of having the right person in the right place and how certain connections, or 'relatings', might determine whether an individual pursues a career in the biodiversity sector. I propose that *who* you have in the marine sector, will also affect *what* kind of up-skilling opportunities and practices are required for the sector.

5.10 Case study nine: WESSA

The EcoTourism Unit of WESSA runs two marine-focused initiatives, namely the Blue Flag Project and the Blue Flag Programme. I conducted a telephonic interview with the general manager of the EcoTourism Unit and as was mentioned in Chapter Four, there was no official skills strategy or human capacity development document for this case. Also, due to the nature of their work, there were no peer-reviewed papers that were relevant for this organisation. No associations could be found between the EcoTourism Unit of WESSA and the observations conducted as part of this research. WESSA is a national NGO and differs from the other cases in this study as it is not a conservation agency, but plays a critical role in implementing environmental and conservation initiatives in South Africa. WESSA works with international eco-labels, of which the Blue Flag Programme is one, as well as projects that involve environmental education and skills development training. It was thus deemed appropriate to include WESSA as a case study and the general manager began by explaining the difference between the Blue Flag Project and the Programme.

5.10.1 The constitution and enactment of up-skilling opportunities via sayings and doings

Management skills

The Blue Flag Programme is the eco-label that is awarded to beaches that meet a standard of excellence in a number of ways and recently, the programme has been extended to boats and marinas. The Blue Flag Project, on the other hand, is run in conjunction with the national Department of Tourism and operates at the Blue Flag beaches but involves "employing 200 disadvantaged youths as part of a learnership programme" (ManagerN1). There are four permanent staff members on the Project (including a senior manager) and they are overseen by ManagerN1. When asked what he looks for in a manager and how important formal qualifications are, ManagerN1 replied: "If I was to employ another project manager, a natural scientist would not be one of the major skills I'd be looking for… I'd rather be looking for someone who's got more technical skills in project management." The 'technical skills' he referred to here, may include attributes like being able to solve problems and communicate effectively, or write up project reports and put in proposals to possible funders. Experience in leadership positions would be one way of developing and demonstrating these skills but as far as accredited courses or certificates, ManagerN1 was not sure of any in particular: "There are a number of courses out there, I don't know them specifically, but I mean the project management spaces are quite populated at the moment because people are realising that there

are skills lacking" (ManagerN1). Linked to this statement is the fact that WESSA is beginning to adopt more of a business model for the projects and programmes they run and ManagerN1 explained: "I think it's that shift from the hard sciences to running under business models". He explained that there is almost a focus on developing products that can be "sold" rather than simply running projects from a natural science perspective. He suggested that "maybe technikons should take on more science to better prepare people for such positions; or universities should include a more technical, business-orientated side to the science degrees" (ManagerN1). This is an intriguing suggestion and it may not work in all cases but would certainly be worth considering for NGO-run projects and management positions in some organisations.

We also spoke about how he appreciated his background in geography and environmental studies. On this topic he said:

> I cannot fault the skills I was taught as a geographer because of the holistic nature of geography. It was one of the only natural sciences that was available at the time that I was studying, that brought in a human element, and brought in elements of the economy, and elements of development of infrastructure into the natural sciences. (ManagerN1)

This concept of a holistic approach to skills and competencies is not new and Eraut (2007) talked of developing learning organisations where senior management needed to consider learning and the factors influencing workplace learning in a holistic way. Fenwick (2006) also mentioned a holistic approach to capabilities that are embedded in meaningful activity, while Allais (2012) explored vocational education and how the resulting employment relationships are "founded on abilities that are multi-dimensional and holistic" (p.635). From the above quote and further consideration, it could be said that management skills are not easily defined and this presents challenges when looking at the up-skilling opportunities and practices for this position in the marine sector.

Time and risk

Discussing what opportunities are available for the staff working under him, ManagerN1 pointed out that "it's a tricky one for a general manager to say: 'this, this and this' needs up-skilling right now, while they're a project manager" as it takes precious time away from them working on the project. He would rather identify a more junior level person and put them through training in order to prepare them for future senior project management opportunities:

"There's too much risk in the project space, to take a project manager out and put them through training" (ManagerN1). A similar response was given when asking about conferences and ManagerN1 said he would like to, and does try to, but "it's something that is becoming more difficult to do, [because] we are pressed to spend more time on our projects" (ManagerN1). The issue of time pressure and both human and financial resources, is discussed in more detail in Chapter Six but these restrictions and risks associated with training and learning opportunities are significant considerations for this research into up-skilling.

5.10.2 The constitution and enactment of up-skilling opportunities via relatings

WESSA has close ties with the national Department of Tourism but less so with DEA and the nature of their work in the EcoTourism Unit would explain this connection. When asked about other organisations such as ORI, Ezemvelo or other conservation agencies, he explained: "There are loads of opportunities for us to collaborate with those organisations as well as independent researchers, but we don't… I'd say [we don't] have any formal agreements with the research organisations or management agencies" (ManagerN1). He went on to describe how they will meet up at conferences but "unfortunately" (ManagerN1) there is no official collaboration on projects. As mentioned earlier, it is becoming harder for WESSA staff to attend conferences but ManagerN1 said if he does go, it is to the more focused ones, "on the coastal sector, blue economy jobs, anything where government may be promoting new projects or opportunities for new projects in the coastal space" (ManagerN1). These relatings highlight the differences between this organisation and those previously described but these relationships and socio-political arrangements all contribute to the marine sector and will influence the up-skilling opportunities and practices that take place in, and for, the sector.

5.11 Summary

This chapter used the sayings, doings and relatings of practice architectures to provide thick descriptions of the findings that came from the data analysis phase of this research. In an effort to answer the sub-question regarding what up-skilling opportunities and professional practices exist in, or for, marine organisations, I have provided insights from the semi-structured interviews, as well as the documents and observations. Tables 5.1.1 and 5.1.2 below act as a summary of the salient findings from this chapter and, as described by

Kemmis et al. (2009), the tables are an example of how the sayings, doings and relatings can be used to interpret and explore the findings from research into professional learning. A brief explanation of the key findings is provided below the tables.

Table 5.1.1: Summary of key findings: Sayings, doings and relatings in each organisation (ORI, SAIAB, DEA, SANBI & CapeNature)

	ORI	**SAIAB**	**DEA**	**SANBI**	**CapeNature**
Sayings	Up-skilling opportunities are often directed at a specific initiative (such as MPA training, or taxonomic identification)	Skills development: person-to-person basis; scientists drive the process of their own up-skilling	Short courses are seen as valuable and there is an emphasis on accreditation	No evidence of marine-specific up-skilling opportunities	The MPA management training course is an important opportunity for professionals to learn about the unique challenges of marine, coastal and estuarine environments
	Ongoing staff development and training. The problem of scope for growth.		To achieve the strategic objectives DEA aims to "attract and retain the right skills and talent"	Inputs such as formal qualifications or work experience in the relevant field are considered when hiring staff. Outputs include students supervised or papers published.	HCD strategy document talks about more skills, more equitable skills distribution, and new skills. Alignment with transformation principles is also emphasised.
Doings	Watershed moments: certain experiences were turning points for the careers of marine scientists	Peer-reviewed papers are important for researchers/scientists and influence employment opportunities	Operation Phakisa meant staff had to learn new skills and expand their knowledge in certain fields	It appears there is a systematic and structured approach to up-skilling	In-house training focuses on specifics of marine and estuarine management, aiming to develop capabilities that allow staff to communicate effectively with scientists
	Communication between science and management (making management recommendations as a scientist)	Transformation in the marine sector: marine science in SA is not as transformed as marine management. Researchers are predominantly white males		Complex and diverse skills (and knowledge) are required due to the wide scope of projects run by the marine programme	
Relatings	Attending the right conferences is critical for networking and knowledge sharing	Hierarchical structure at SAIAB but power relations do not seem to create negative relations	A focus on partnerships and collaboration for accreditation purposes: universities and/or CATHSSETA	There is a close relationship with DEA but collaboration with other organisations is essential for many of the projects	Managers should be encouraged to attend conferences and budget should be made available for this

	Supervisors as mentors	One-on-one relationships between scientists and managers are beneficial for both parties involved and conferences are a good place for positive interactions and communication	The power relations in a national department are important as there will be consequences for other organisations operating under them	Conferences are useful for networking, forming abovementioned collaborations and finding out what other researchers are doing in the marine field	The ability to communicate is linked to an individual's attitude and character. Communication and forming relationships with scientists in the appropriate field is essential

Table 5.1.2: Summary of key findings continued: Sayings, doings and relatings in each organisation (WWF, SANParks Ezemvelo & WESSA)

	WWF	**SANParks**	**Ezemvelo**	**WESSA**
Sayings	Staff draw up a development plan with their manager but there is a move away from technical skills and knowledge; and towards management processes and flexibility/adaptability	ScientistÇ1's PhD and scientific background is useful when it comes to re-interpreting science to make management decisions	Having a PhD or even a Master's degree can lead to an individual becoming too specialised or 'over-skilled' which affects employability	WESSA is adopting more of a business model for their projects so natural science is not really a requirement. Technical skills in project management are more relevant
	A shortage of time to attend or take part in up-skilling opportunities is identified as a problem	ManagerÇ1 explained how difficult it is to find someone with the diversity of skills that are required. And who is passionate, and who meets the employment equity requirements	Internships are valuable but if there are no positions in the organisations the learnt skills may be wasted. And contract positions offered are not always that attractive.	A holistic approach to skills and competencies is discussed and the importance of social and economic aspects in marine jobs today
Doings	WWF offers a two-month sabbatical-type opportunity to individuals for skills/personal development that relates to their work	ScientistÇ1: firearm training and a skipper's course are important for managers in the marine section	Operation Phakisa meant an increased need for planning, biodiversity assessments and communication with the various stakeholders	Due to the way projects are structured and financed at WESSA, *time* is limited and there is risk involved in taking time off for up-skilling
	Work experience in the marine/fisheries field and having 'people-skills' is often more meaningful than doing a formal degree or having the right qualifications	ManagerÇ1: anyone involved with MPAs should attend the MPA management training course, as well as abovementioned courses		

Relatings	WWF tries to play an intermediary role between DEA and expert consultants; also between science and managers/practioners in the marine sector	ScientistÇ1 said she had support from other SANParks staff when starting out. She also brings together researchers and managers	Communication skills are learnt through experience and out of necessity. Conferences facilitate communication.	Although there are opportunities for collaboration with other marine organisations, they do not have any formal agreements and this is an area that needs more work
	There is a reliance on key partnerships for much of their work in the marine programme. Mentors, usually unofficial ones, are vital. Also drawing motivation from colleagues	ManagerÇ1: many close relations with other organisations. Discussions around race and employment equity focused on the nature of the work in the marine sector	There are positive relationships between the Ezemvelo scientists and the Ezemvelo managers, but relations and links with other organisations need development	

Tables 5.1.1 and 5.1.2 present a summary of the sayings, doings and relatings from all nine case studies that made up this research into up-skilling in the marine sector. The contents of the two tables was synthesised by means of looking at the sub-themes in each case and extracting the key findings. Case studies one through to five are presented in Table 5.1.1 (ORI, SAIAB, DEA, SANBI and CapeNature), while cases six to nine make up Table 5.1.2 (WWF, SANParks, Ezemvelo and WESSA).

The sayings, doings and relatings from ORI included: discourse around ongoing staff development, the significance of certain moments or opportunities that were presented to the participants, communication between scientists and managers and the importance of networking and role model relationships. At SAIAB, the relationships between scientists and managers were also highlighted but in addition, there was discussion around the doings that lead to transformation in the marine sector, as well as the necessity of publishing their research as marine or estuarine scientists. The sayings, doings and relatings of DEA – Oceans and Coasts differed from the other cases in many ways, as the value of short-courses was mentioned and the skills needs of Operation Phakisa were discussed. The role of partnerships and collaboration was noteworthy and any power relations present were influential for the other organisations working with, or under DEA. The manager at SANBI explained what would be considered and input or output when it comes to qualifications and skills in the marine programme and the required skills are complex and diverse due to the wide range of projects they run. Like DEA, collaborative partnerships are important for SANBI and conferences were cited as worthwhile for staying informed on what research was taking place in the marine sector. The sayings for CapeNature revealed the benefits of the MPA management training course and the HCD strategy stated that skills needed to align with the transformation principle of the organisation. The doings focused on the in-house training that occurs and the relatings covered conferences, networking and the value of communication. The manager suggested that the ability to communicate effectively might be linked to an individual's attitude or character.

Table 5.1.2 presents the sayings, doings and relatings of WWF in the first column and these were centred on the staff development plans and how they are looking for managerial skills more; the shortage of time for up-skilling; the opportunity to take a two-month sabbatical for

personal or professional development; the people-skills needed for working in the field; and how WWF plays an intermediary role between DEA – Oceans and Coasts and other parties. Additional relatings included how WWF rely on partners for much of the work they do and the important role that mentors/colleagues play for motivation and inspiration in the workplace. The sayings, doings and relatings of SANParks came from two marine professionals, a park manager and the marine coordinator (ScientistÇ1), so the findings incorporate the narratives of both these participants. A science background was important in the case of ScientistÇ1, but the manager spoke about being passionate and having the right skills for the job. Employment equity was also a significant discourse in this case. Both participants mentioned the more practical doings such as firearm training and skipper's license but the topic of the MPA management training course also arose as noteworthy. Relations with other organisations were stated to be essential by the park manager.

At Ezemvelo, formal qualifications were discussed and the issue of becoming over-qualified was a saying of interest. The value of internships in the organisation was also noted and Operation Phakisa was revealed as a doing that meant an increase need for communicating with various stakeholders. Relatings at Ezemvelo included communication at conferences, and the positive relationships within the organisation but also the need for better relations between Ezemvelo and other marine and coastal organisations. For WESSA, project management skills came through as an important saying (as was the case for WWF), as well as taking a more holistic approach to skills development to align with the business model that they follow. A conversation about time and risk was categorised as a doing and the manager expressed the opinion that their 'relatings' with other organisations was an area that needed further development.

The following section draws on the findings described here to reach conclusions for this chapter. These are then re-visited in the beginning of Chapter Six and are discussed further in Chapter Seven.

5.12 Conclusion

The conclusions that are drawn from this chapter are presented in Table 5.2 below. This synthesis work originates from practice theory and follows the layout of practice architectures as suggested by Kemmis et al. (2009) (see Chapter Three, Table 3.2). Thus, in Table 5.2, I draw on the terminology used in practice architectures (see Section 3.3 on practice theory) to consider how the sayings, doings and relatings 'hang together'.

Table 5.2 is by no means exhaustive and it focuses on the most common sayings, doings and relatings from the cases. As can be seen from the thick descriptions provided in Chapter Five, there were other findings of interest which emerged from only one or two cases. These are no less significant, and are discussed in more detail in Chapters Six and/or Seven.

Table 5.2: How the sayings, doings and relatings that constitute the up-skilling opportunities and practices of marine professionals in South Africa 'hang together'

Sayings	A focus on marine conservation, knowledge and education for the organisations, and in turn the marine professionals. Key experiences throughout their lives have influenced their careers and up-skilling choices. Skills development or training is generally done on a person-to-person basis and the professionals drive the process of their own up-skilling in many cases.
Doings	Up-skilling as an ongoing activity and the opportunities that are more formal or accredited are recognised more readily. For example: a university degree, skippers training, the MPA management training course, statistics courses, etc. However gaining experience by being in the field (a 'material' aspect of the doings) or through learning on-the-job was also significant for the marine professionals (i.e. the everyday work-activities were important).
Relatings	Learning from others – whether co-workers, supervisors or employees from other organisations, these influential relationships held power for the individuals in the marine and coastal workplaces. Also the power-dynamics between government departments and the conservation agencies/NGOs and research organisations shaped the opportunities for marine professionals.

How this 'hangs together'	The practice landscape for marine professionals in South Africa is one of formal *and* informal opportunities where individuals learn from one another and by participating in everyday work activities, but also through training programmes and accredited courses. They exercise agency when taking up the available up-skilling opportunities and have an attitude of adaptability and enthusiasm in most cases. Marine professionals are key role players, not only when taking part in up-skilling practices but they also contribute to, and shape, the practices in the marine sector.

The conclusions made in Table 5.2 are general statements about the 'project' (see Schatzki 2002 and Kemmis & Heikkinen 2011)and by using the concept of practice landscapes we can begin to consider the 'habitus' of the players in this research, which are the marine professionals and associated organisations that participated in this study. The agency exercised by the marine professionals is important moving forward and in Chapter Six, this aspect is explored in more detail. What should also be carefully noted is the conclusion that the professionals in this research do not simply take up available opportunities but also contribute to, and shape, the up-skilling opportunities and practices in the marine sector. This helps in answering the second part of the sub-question that this chapter set out to address, which was about how up-skilling opportunities and professional practices are constituted and enacted via practice-based sayings, doing and relatings. Furthermore the learning processes must not be overlooked and I propose that the up-skilling opportunities and practices in this research are intertwined with professional learning. The findings of this chapter and the next are inherently linked to the learning processes of the marine professionals.

Chapter Six draws on the same nine organisations and 18 individuals (as well as the observations, documents and peer-reviewed papers) but considers the data from a different point of view, where agency, learning, and the materiality of the marine workplaces and professional practices are highlighted and discussed.

CHAPTER SIX – Exercising agency within the socio-material realities of the marine sector and the associated learning through the formal and informal up-skilling opportunities

6.1 Introduction

When considering the sayings, doings and relatings from Chapter Five, it is worthwhile to summarise the findings using the four-planar social being model (Social Cube) as described by Bhaskar (1993). By adding this layer of synthesis, the data can be expressed in a more meaningful way and the role of agency becomes clear, which is important for the discussions in Chapter Six. Table 6.1 therefore serves as a summative analysis of the key findings from Chapter Five, and Chapter Six will take this analysis further.

Table 6.1: Links between the key findings from Chapter Five and Planes [a] – [d] of the four-planar social being/Social Cube

Links to plane [a]	The **material transactions with nature** are reflected in the sayings and doings presented in Chapter Five. Key experiences of the participants have been specific to the marine environment and many of the doings are closely tied to the particular requirements of the marine sector (e.g. MPA training or a diving qualification).
Links to plane [b]	**Inter-intra subjective relations** are very much in line with the relatings in this study and the concept of power in personal and organisational relationships is applicable here. The sayings regarding an individual driving their own up-skilling or learning also support the ideas present in plane [b] of the Social Cube.
Links to plane [c]	Once again, the relatings of practice theory and the **social relations** that make up plane [c] are connected through the social-political dimensions of the relatings described.
Links to plane [d]	The **subjectivity of the agent** ties in with the agency shown by participants when taking up learning opportunities. It is also linked to the discourse around being passionate about their work in the marine sector and adaptable when faced with new challenges or tasks.

Chapter Six builds on the above concepts as well as the practice architectures that were outlined in Chapter Five, by drawing attention to the importance of the socio-material aspects of this research and through considering the role that agency plays in the up-skilling that takes place in and around the marine workplaces. This chapter also explores the nuances of

formal and informal opportunities or learning that occur in the marine and coastal organisations that form the case studies of this research and I specifically consider the experiences of the managers and scientists, as reported in the interviews. In addition, the documents and observations that were included in the analysis phase of this research are incorporated into this chapter and discussions focus on learning, agency and the social-material. The sub-question that this chapter responds to is:

> How do the individuals learn and exercise their agency within the socio-material realities of the marine scientific and management context, through making use of up-skilling opportunities that are both formal (e.g. course-based) and informal?

When working with the concepts in this sub-question, it is important to remember that each one has been worked with in many different contexts and there is extensive literature on any one of them alone. However, working with them in a particular situation, in this case marine and coastal organisations requires focusing on the relevant aspects of each concept. Agency, for example, has become popular amongst researchers looking at professional identity but as Eteläpelto et al. (2013) pointed out, its meaning often lacks clarity. In Chapter Two, the concept of agency was explored in detail and an explanation was given as to how it was used in this research, whereas in this chapter it will become clear how it was used in conjunction with the socio-material approach to workplace learning and up-skilling opportunities. For each organisation I will consider how agency is associated with:

a. The socio-material realities and how this influences learning;
b. The formal up-skilling opportunities, events and programmes and the impacts on learning; and
c. The informal up-skilling events, experiences and processes and the impacts on learning.

By recognising that agency is intertwined with learning and the socio-material realities of the practice, one can reflect on the up-skilling opportunities and practices in a manner that highlights and uncovers important aspects of this phenomenon. From this point, it is possible to contemplate the deeper generative mechanisms at work in Chapter Seven, through the philosophical lens of critical realism. The ways in which agency, socio-materialism and practice theory are related must also be kept in mind when considering the focus of this chapter and it should be noted that much of the data presented here could also have been used in Chapter Five, when discussing the available up-skilling opportunities and practices, and

how they are constituted and enacted via the sayings, doings and relatings of the workplace practices being investigated in these organisations.

In Chapter Three, the reasoning behind taking a socio-material approach was explained and it was put forward that marine science and management involve professional practices that are socio-materially shaped. The marine and coastal ecosystems or environments are central to these practices and have a strong influence on how the individuals act, think and relate in the workplace and therefore what skills, capabilities and knowledge they develop or require. This concept is also explored from the perspective of the four-planar social being due to the relevance of the plane of material transactions with nature and the way in which human and non-human agency is conceptualised. The other three planes are also appropriate for summarising the data presented in this chapter and are thus used to pull together the significant findings in a meaningful way. The elements of time and space that the Transformational Model of Social Activity includes are also appropriate when examining the socio-material realities that are encountered by marine professionals and these are picked up in the final sections of this chapter.

6.2 Case study one: ORI – SAAMBR

As a research institute, it is understandable that there is an emphasis on learning and knowledge in the workplace but due to the fact that the majority of the projects also involve fieldwork, there are practical or technical skills that play a role in the day-to-day life of the researchers too. With regard to the subject of learning, the director of the institute said: "You learn all the time, you can't plan your learning" (ScientistR4). This gives a general idea of how learning is perceived in this, and other, organisations.

6.2.1. Agency associated with socio-material realities and learning

Up-skilling opportunities or practices *do* sometimes have to be sought out and if there are no formal requirements then the scientists will initiate the process of seeking these opportunities. Having recently completed her doctorate studies, ScientistR2 argued: "You have to be a bit of a self-motivator and put yourself out there" and the same goes for finding funding for these opportunities. Here, the individual's agency is clearly shown but it must also be noted that the financial resources to attend, or take part in training or up-skilling initiatives, is a socio-

material reality that needs to be considered. The director also admitted that when it comes to remuneration at ORI it is about "job satisfaction, but the salaries are poor" (ScientistR4), and this issue permeates through many aspects of the organisation and its employees. This was reiterated by ScientistR1 who explained why they take on projects with small funding grants: "we just do the work because we know it's the right thing to do. Our hearts are in the right places, we've been doing it for 60 years, so we [are] trying to keep it going, on that basis" (ScientistR1). This work is usually in collaboration with Ezemvelo KZN Wildlife or other conservation bodies and in the above quote he is referring to commitment, motivation and passion for their jobs which was mentioned in Chapter Five but will be discussed at length later in this chapter too.

Another example of agency is when, prior to working at ORI, ScientistR3 was consulting and felt she was not making a difference or contributing to the field of estuarine research, like she had hoped to, so she approached the then director of ORI and proposed the idea of an 'Estuaries' portfolio in the institute. This would also be an example of "putting oneself out there" as ScientistR2 suggested and in terms of her learning, ScientistR3 said: "I felt there were gaps" (in her training) and "I've really learnt by doing… *A lot* of self-taught [skills]." This discourse around 'learning-by-doing' is a dominant one, not only at ORI, but also at the other organisations. It speaks to the socio-material aspect of how discourses define the practices that occur and the agency involved in the skills and knowledge development in the workplace. The importance of experience and learning 'on-the-job' is explored further, under the section on informal up-skilling events, but the agency shown by nearly all the interviewees at ORI support this notion. The director described how he set up his own company in Cape Town at one time and he mentioned "all the laws you had to understand; how to hire people, how to fire people… So that was trial by fire" (ScientistR4). Again, the discourse is learning through experience and ScientistR4 intimated here that this often involves learning from one's mistakes and trying again.

The peer-reviewed papers that were included for ORI give a good idea of the research that takes place in the institute and the challenges the scientists deal with in their projects. The socio-material realities of studying the 'local habitat drivers of macrobenthos' or assessing 'high-latitude coral reef fish communities' (see papers listed in Section 4.4.1) involve a very specific set of skills and knowledge. The learning that occurs in these situations is inevitable and agency will play a large role in these research projects, as well as the opportunities for

learning that preceded these research projects. Other published papers show the very technical nature of some of the research that occurs, such as the 2000 title: 'Comparison of the fillet yield, protein content and amino acid profile of *Clarias gariepinus* and the *Clarias gariepinus X Heterobranchus longifilis* hybrid'. Another example is the 2010 paper: 'Macrobenthic invertebrate responses to prolonged drought in South Africa's largest estuarine lake complex'. Here, the authors (in this case there were three authors) need to have an understanding of the estuarine lake complex, the invertebrates which they are studying, and must be able to work with the data relating to the prolonged drought. It is evident from the peer-reviewed papers that there are definite 'material transactions with nature' (plane [a] of Bhaskar's four-planar social being model/Social Cube) for the scientists at ORI. Thus, it is vital that the material-ecological aspects of the professional practices are examined when considering up-skilling opportunities and practices.

Returning to the subject of financial resources, ScientistR2 pointed out that much of the funding that was used for her to attend courses or training programmes came from a specific project she was working on, or sometimes her own bursary (while studying). She also raised the issue of time and said: "I think there's always opportunity for training, it's just time. So much time… And money…" (ScientistR2). She added: "I think in South Africa, there's such a small pot of money that everybody's competing for, it's very difficult to get funding". She explained how scientists spend so much time trying to acquire this funding, as well as publishing their work, that there is not much time 'left' for training, sharing of ideas, making management recommendations, or other up-skilling and networking activities. This is particularly a problem for an institute like ORI who are not government funded and may hold true for other organisations such as WESSA. However, it should be made clear that financial constraints, as well as time constraints, are common across almost all marine branches of the organisations involved in this research and funding could be said to be a pivotal material element when considering the up-skilling opportunities and practices in the marine sector. In addition, it should be noted here, that time and space are included as elements in the Social Cube and Bhaskar recognised these elements as affecting agency (Bhaskar 1993, see Section 3.2.3). This is meaningful due to the fact that this chapter focuses on the socio-material realities, and agency plays an important role in all aspects of this chapter, and the research in general.

6.2.2. Agency associated with formal up-skilling opportunities/programmes and learning

I consider accreditation a key socio-material reality in this research and formal qualifications were a major talking point for the interviews, at all the institutes and organisations. As has been mentioned in previous chapters, ORI is largely an academic institute and all the scientists had doctorates, some more recently than others, but ScientistR1 pointed out the following: "I suppose from a scientific perspective we tend to assume that our degrees are adequate" but he continued: "because my background has largely been in fisheries, I tend to think that's not sufficient, really" (ScientistR1). He argued that you need to have more of a "hands-on feel for the situation that you're hoping to improve" and in his case it means having "some exposure to the fisheries that you are hoping to improve [the] management [of]" (ScientistR1). This can be attributed to the fact that much of the marine research the ORI scientists conduct is applied science and is seldom purely for theoretical purposes. I propose that the formal training an individual receives through doing degrees at a university only teaches one so much and this notion comes from insights such as ScientistR4 commenting that his "PhD was not a major starting point in my life" or ScientistR1 saying: "there's definitely scope for accreditation beyond your formal degrees… But then there's more informal training and somehow that needs to be recognised or accredited I guess".

The conversation around accreditation is a complex one and there do not seem to be many recognition of prior learning (RPL) initiatives in South Africa although as Sisitka et al. (2016) pointed out, recognition of prior learning does appear in legislation and is acknowledged as a "valid process for ensuring that, in particular, previously marginalised and disadvantaged people can receive due recognition of their skills and understandings" (Sisitka et al. 2016, p.3). Despite it appearing in legislation, the broad implementation of RPL programmes in South Africa is lacking (ibid.). The WIO-COMPAS programme that was outlined in Chapter One serves as an example of a functional initiative where RPL is employed and although some South African marine professionals have participated in this programme, there could be more opportunities for individuals to attend. Otherwise, a similar programme could be developed in South Africa for those who have skills and knowledge gained through experience, rather than formal qualifications.

On a related note, ScientistR3 expressed her opinion on the subject of marine professionals needing formal university degrees:

> I really feel a bit sad that people feel their only opportunity to get anywhere is to have a university degree and post-grad [qualification]. We should be offering other things because there are so many things we can offer; a diploma in science management [for example]. (ScientistR3)

And she went on to say that she believed this contributes to the divide between scientists and managers, which she calls "massive" (ScientistR3) in KwaZulu-Natal specifically. She also thought marine managers should have some form of scientific training or background due to the interconnectedness between marine science and the management of MPAs or reserves that include coastlines. ScientistR3 explained that this does not necessarily need to be a PhD or university degree but managers should at least have some basic science background or a diploma of some sort. This idea corresponds with the comment made by the SANParks marine coordinator that was reported in Chapter Five, where she mentioned how most managers do not have a conservation background but come through the administration or tourism channels in the organisation. The concerns described here have multi-faceted implications for up-skilling opportunities and practices in the marine sector and as the researcher I am obliged to consider what is currently available for managers, as well as scientists, and what possibilities there might be for improved up-skilling opportunities or practices. The option of more holistic training within universities and technikons is one approach (see the discussion and suggestions made by the general manager of WESSA in Chapter Five) or another option would be a WIO-COMPAS-type programme for marine managers. Such considerations are picked up again in Chapter Seven.

When it comes to accreditation for the scientists at ORI, another aspect to take into account is whether they have registered as a professional scientist with SACNASP (the South African Council for Natural Scientific Professions) which, as the name suggests, is the legislated regulatory body for Natural Science Professionals in the country. ScientistR3 brought up this point and about registering:

> It was *only* because we could not tender for things coming from DEA, it was not because we thought it had a value system any more. I really believe it did at some point but now it is just to tick a box. (ScientistR3)

Although this platform has the potential for scientists to network and build capacity in creative and meaningful ways, it was not mentioned by any other participant and does not seem to be functioning like it once did. This illustrates that in some instances the socio-

material dimensions exist, but are not fulfilling their potentials as learning spaces for the professionals in the sector.

6.2.3 Agency associated with informal up-skilling opportunities/experiences and learning

As previously pointed out, the discourse around experiential, informal learning was dominant at ORI and elsewhere, and agency plays a key role in these situations. To start with, the individual needs to be motivated and committed to their career and often this stems from a longing or passion that may have developed at an early age. ScientistR4, for instance, remarked how he had always wanted to be in conservation: "I traced back my first thoughts to what I wanted to be" and in Class Two of primary school, they went a school trip to the aquarium and "I decided I wanted to get involved with animals" (ScientistR4). This pivotal experience set him on a course that included a number of varied and challenging experiences and he commented how he learnt from his colleagues when travelling overseas for one job: "They taught me huge amounts about business and being a salesman; and setting up business plans and all that sort of stuff. That was true mentorship" (ScientistR4). Here, he brought up mentorship and as was discussed in Chapter Two, I consider this an important form of up-skilling where a great deal can be learnt through other workers or "a more expert other" as Billet (1995, p.22) put it. Whether an individual receives direct guidance, or if they simply observe those around them in the workplace, this form of learning has been shown to be valuable and transformative. An insight that supports this notion came from ScientistR1 who commented on how, since completing his PhD, he has learnt the most through "interaction with my peers and colleagues, rather than any formal or informal mentorship, so again – learning by experience and interaction".

ScientistR3 also mentioned the role that unofficial mentors had played in her career in estuarine ecology and named a few people who she described as "the big guys in estuarine science". She also said that for the marine knowledge and skills she needed, "it was really just learning by doing" (ScientistR3). Expanding on this, she added: "Something I've realised, for myself, is that this 'learning-by-doing' – I don't think it's [just] an impression, I think it is a reality". She then speculated on the opportunities and initiatives that young people have today and she thought there were many more opportunities now, than there were in the past. However, she wondered if there would come a time when the junior staff in an organisation or research institute will have better training and more experience than the

senior scientists, but thought they might not be able to see the bigger picture or have the broader understanding to "pull it all together" (ScientistR3). If this were to happen, there would be consequences for the relatings in the workplace and the available up-skilling opportunities and practices may need re-inventing to account for such changes.

Returning to the socio-material realities of these learning and up-skilling experiences, ScientistR1 made some significant comments regarding the nature of the work of the scientists at ORI, and spoke about his past experience: "I suppose, hands on the ground, being on the ground with a particular fishery, you learn… And I think it's a very useful way to have insight; very useful background to have. That's sort of, on-the-job learning, I guess". When he talked of "on the ground" here, he meant out at sea; he had explained prior to this statement: "Going out to sea on trawlers, I suppose, was an education in itself. I'd never been exposed to that sort of situation before" (ScientistR1). Again, he refers to learning as an ongoing, experiential process and the material aspects of the work are clear from these comments. Similarly, ScientistR4 explained how one of the senior scientists interacts with the fishermen who are in small scale fisheries along the coastline and in his words, the scientist has to "try to educate them on fishing, but they arrive there with 4x4s and nice rods and things he doesn't even have". These material considerations and the implications for the relationships that are formed, the work activities that take place, and ultimately, the skills that are needed, are crucial when searching for the deeper structures and mechanisms at work and an individual's agency cannot be separated from this web of factors affecting up-skilling.

6.3 Case study two: SAIAB

Although SAIAB is a research institute like ORI, it differs from ORI in a number of ways; most notably, it is an NRF funded institute and has a somewhat broader mandate. The scientists at SAIAB also have distinct, socio-material concerns that may not always be as hands-on as the scientists at ORI. Furthermore, they have to source much of their own funding and as ScientistÄ1 explained, "one way we can do it is through publications". The drive to publish at SAIAB was explored in Chapter Five, but the director of the institute pointed out that any courses the staff participate in, are usually paid for by funding from SAIAB, or through the scientists' own funding, or they can apply to NRF. This aligns with the statement in the HR policy document that was included in analysis, saying that executive managers should ensure the "provision and management of resources and an enabling

environment for employee training and development" (p.8). The issue of financial resources, as well as agency and the effects on learning, are expanded in the following section.

6.3.1 Agency associated with socio-material realities and learning

While discussing available up-skilling opportunities in the marine sector, the director commented on the agency of the scientists and how fortunate they are in many ways by explaining that he had not had the situation of a scientist coming to him and saying they did not have the resources to attend a certain opportunity or training event. He clarified: "SAIAB is a relatively resourced marine institution, with a relatively strong academic mandate, so it won't necessarily be the same for museums and NGOs" (ScientistÄ3). However, he followed on by saying:

> The biggest challenge that scientists face within SAIAB, is that there are only so many hours in a day; so they've got a very tall order to supervise; to do their own research; to sit on institutional committees, which they have to… So put an extra load of training... they tend to drive it [themselves]. (ScientistÄ3)

So here, again, the question of time *and* money is raised and these socio-material realities affect up-skilling opportunities and practices, especially if one includes the topic of accreditation. The director explained that if one of his staff came to him asking if they could take eight weeks off to do a course but it was not accredited, he would "seriously question the background and the value of that course" (ScientistÄ3). This statement overlaps with the theme of formal opportunities or qualifications but serves to illustrate how a scientist's time is a valuable commodity and when looking at up-skilling opportunities, a scientist should be fairly subjective towards accredited courses or programmes. Accreditation itself can be seen as a socio-material reality and the certification of skills or knowledge relating to marine science, such as using statistical software to model the movements of a fish species, or publishing research in an academic journal, is crucial for many research institutes.

The importance of publishing was discussed in Chapter Five and reference was made to the peer-reviewed papers that reveal some of the practical skills that may be needed as a scientist or researcher at SAIAB. However, these peer-reviewed papers (see Chapter Four, Section 4.4.1) also demonstrate how the materiality of the marine environment is so closely connected to the practices and knowledge requirements in an institute like SAIAB. These requirements can range from understanding a fish species and its movements (the 2017 paper on *Rhabdosargus holubi*), to researching the consequences of stock exploitation of a commercially important species (the 2015 paper on *Chrysoblephus puniceus*), or the role that

a national park plays for shore-angling fish (the 2002 paper on the Tsitsikamma National Park). The breadth of topics covered in the published papers is vast and one must also remember that in different geographical regions, the ecosystems will differ, to some extent. It is for this reason that I consider the material-ecological aspects of this research to be so significant.

6.3.2 Agency associated with formal up-skilling opportunities/programmes and learning

Continuing the conversation regarding formal certification or opportunities, the director makes it clear that an individual will not be employed as a scientist at SAIAB if they do not have a doctoral degree. This is the nature of the institution and once employed at SAIAB, there are a number of in-house courses or training workshops the scientists must attend. Although these courses are not certified, they are usually related to the HR division and may include workshops such as how to run an evaluation, or supply-chain management. An example from the training information document (2012-2016) would be the Workflow National Travel Requisition Training that many of the employees attended. In the HR document on policies and procedures for Education, Training and Development, there is also a line about how individual employees are encouraged to keep a "learning log of what they have learned and how they have applied the outcomes of their learning in their work" (p.8), but there was no mention made of such a learning log by any of the scientists. It is probable that this process is not being actualised, or at least not by the senior scientists.

There are also opportunities in the form of courses run by Rhodes University, such as business management and these would be accredited. The HR document mentioned above also confirmed that when SAIAB outsources training, preference is given to "fully accredited Training Service Providers" (p.11). The potential for learning in these courses is not always clear and ScientistÄ3 pointed out that often the scientists attend workshops that are not accredited but are still beneficial to their knowledge and skills base. For example, these workshops may include: how to track different fish species; the latest genetics techniques; using statistical software; modelling the state of a fishery, or other highly practical subjects. ScientistÄ3 referred to this as "cross-pollination between scientists" and in terms of their agency, the scientists have to be motivated to take part and learn from each other in these situations. The specialisation that occurs among the scientists in a research institute like SAIAB is also a matter to be considered and ScientistÄ3 mentioned that a few of the

scientists are “more-or-less self-taught in their fields”. This is not through any formal courses or channels but involve the individuals’ agency and their interests, as well as previous experiences. These notions will be explored in the following sub-section on informal opportunities and experiences, which the HR policy acknowledged as important and stated that the NRF should make “all reasonable and cost-effective efforts to recognise prior learning and experience of employees” (p.1).

The topic of the MPA management training course is also relevant when exploring how formal programmes interact with agency and learning, and ScientistÄ2 felt the MPA training course is essential for anyone who is employed within a MPA. He mentioned how many of the marine managers and rangers did not have formal training or the “correct credentials or background” so a person will “start a job with a job description and then he actually needs to be educated more, to actually perform at his job” (ScientistÄ2). He continued by speculating that this would mean doing a university degree or a “private course,” possibly something like the WIO-COMPAS programme. Alternatively, he suggested the government needs to set up “major training schools” (ScientistÄ2), where school-leavers can acquire the skills and knowledge to enter the marine sector at a more junior level. This would most likely require a complete overhaul of the education system and mean putting new structures in place for such training, but in his opinion, it would be worthwhile for a number of sectors. For the marine sector, in particular, this training would have to incorporate many of the practical skills and capabilities that were mentioned in Chapter Five, such as diving courses or skippers training. This is where the materiality of the marine environment would play a role and the specific knowledge and skills surrounding marine issues would also be essential for such training programmes.

From the above discussion on formal programmes and opportunities, it can be seen that there are many social and material factors to consider and as Fenwick (2010a) argued, these cannot be separated. The concept of ‘agential realism’ (Barad 2003) is also relevant here and if we consider agency to be relational and existing within assemblages, it is possible to understand much of the joint actions that occur in, around and between the up-skilling opportunities and the material/ecological aspects of the marine professionals’ practices.

6.3.3 Agency associated with informal up-skilling opportunities/experiences and learning

It was mentioned earlier that a scientist will generally choose a field to specialise in, based on their interests and experiences. This idea stemmed from a great deal of discourse in the interviews around passion and past experiences that inspired these scientists to follow the career paths they have. ScientistÄ1, for example, who is close to retirement, said: "I've done that all my life, and I love working in estuaries. If I could turn the clock back I would do exactly the same again… I've enjoyed every day, every minute of my career and [have] no regrets". He also explained that he had good experiences when helping on field trips during his undergraduate degree, at St Lucia, and that influenced his decision on what to do for his Master's degree.

In a similar vein, ScientistÄ2 attributed much of his success in his career to the experience he acquired on the coast and taking part in fieldtrips, during his undergraduate years. These examples of individuals exercising their agency from the early stages of their academic careers, show how important 'exposure' to the field is and something like the Ocean Stewards Programme that was described in Chapter Five, would be an opportunity to provide this kind of exposure. Nevertheless, the significance of an individual's personality also comes into play and Chapter Five referred to will, or motivation to take up up-skilling opportunities as well as passion for one's job. These traits can be associated with an individual's identity and Fenwick (2013) talked of the interrelationships between learning, identity and agency and how it is possible to examine how an individual's identity as a learner, influences their achievements and practices in their working lives. In this regard, ScientistÄ1 said, "one should not overlook the importance [of an individual], and I think individuals do make a difference". He went on to suggest the manager from CapeNature, ManagerB1, is someone who has made a difference to marine management and conservation. The agency and identity of an individual, and in this instance a manager, are highly influential in the learning or potential for learning and ScientistÄ1 also argued that "if a manager doesn't have a degree; and who is involved in marine management in one or other aspect, is passionate about that, they will almost 'interrogate' a scientist if they have the opportunity to learn more". This eagerness to learn from more knowledgeable others can also be a two-way street with scientists speaking to managers about the issues they face on the ground and in fact, the manager from CapeNature mentioned a scientist from SAIAB he felt does this quite effectively (see Section 5.6, under CapeNature in Chapter Five). These are not necessarily mentoring scenarios, but the HR policy also referred to the value of "on-the-job training,

exposure to new challenges and job responsibilities, and coaching and mentoring" (p.18), which gives one insight into the approach that the NRF and SAIAB take to informal learning opportunities.

The director of SAIAB also feels that more informal interactions between managers and scientists could help open the communications channels in the marine sector. Such interactions require certain traits in a person's identity and they need to have the will to go that 'extra distance'. A statement from ScientistÄ2 backed up this idea when he talked about having someone who is a "driver" and as an example, he said: "The things I've set up have not been part of my job, but I got involved" (ScientistÄ2) and he emphasised how he tries to instil, or share, his passion with the students that he supervises. It could be said, that an individual who is passionate about their work, will naturally seek out new opportunities for learning and as ScientistÄ1 said, when talking about what he looks for in a potential student: "The main thing is an interest" and if he can tell a student is passionate, they do not need to be the top student, academically. Taking the above comments and discussions into account, I would contemplate the following idea: to develop this passion in marine professionals it takes enriching experiences in the field and encounters with inspirational individuals, who can share their knowledge and passion for the marine environment with those around them. Without diminishing the importance of formal courses, programmes and opportunities, I believe informal opportunities, practices and experiences play a critical role in the learning and agency of marine professionals.

6.4 Case study three: DEA – Oceans and Coasts

The socio-material realities of a government department like DEA – Oceans and Coasts are, understandably, unlike the other organisations. Firstly, much of the training or skills development that takes place is funded internally by the Department, and secondly, the nature of the projects they run and the work they do, is not the same as the conservation agencies, the NGOs or the research institutes. They have a wide scope of marine, coastal and estuarine issues to respond to and they direct or have influence over, much of the work that occurs in the abovementioned organisations. Overseeing the management of all the MPAs in South Africa is one example of the role of Oceans and Coasts, as well as dealing with legislation and national policies. Other issues include law enforcement within the Exclusive Economic

Zone and international agreements that affect the country's marine and coastal biodiversity or sustainability.

In the group discussion, there was a strong discourse of the necessity of formal qualifications and how relevance to the mandate and goals of DEA is essential. A focus on formal, certified opportunities has implications for the agency exercised by the marine professionals and will determine what kind of learning opportunities they encounter in, through and for the workplace.

6.4.1 Agency associated with socio-material realities and learning

The aspect of funding for training was mentioned above, but what became clear through the group discussion was that *time* was actually the limiting factor for the scientists and managers at Oceans and Coasts. When discussing the implications of Operation Phakisa for the staff involved, ScientistG1 remarked: "the only trouble is that it's come on top of everything else, and we are battling to actually drop things… to free up capacity to do it". This implies that there would not be any time for the senior members of staff to take up training or up-skilling programmes. If they were to seek out up-skilling opportunities, the decisions about what course or training to do would be made on a person-to-person basis and ManagerG2 explained how a scientist or manager would "identify the developmental areas that will assist you to further that particular skill in that area". He went on to mention furthering one's "skills and knowledge in that area" (ManagerG2) and I interpreted this initiative of identifying a course and approaching a more senior manager as exercising one's agency in the workplace, for the sake of up-skilling. Some of these courses or programmes that are relevant for Oceans and Coasts staff are referred to in the section below but it should be noted that in the Annual Performance Plan of DEA (2017/18), the subject of personnel funds is a dominant one and this will impact the agency of the individuals operating in this system. The document also commented on how there has been a reduction in funds allocated to DEA from the National Treasury and the focus of the Department is "on prioritising critical human resources capacity required for the execution of the core mandate of the DEA and ensuring that we operate with the minimum required capacity for support and general administrative functions" (p.5). Such constraints form part of a wider web of interacting socio-material realities and will have an influence on all branches and sectors of an organisation.

The materiality of the up-skilling practices will come through in the opportunities, courses and qualifications that are discussed below, but it should be noted that the marine professionals at Oceans and Coasts come from varied backgrounds and have experience in different areas of the marine sector. Discussing the matters of concern with scientists *and* managers meant diverse insights were gathered and the different participants drew on their individual experiences.

6.4.2 Agency associated with formal up-skilling opportunities/programmes and learning

What ManagerG2 said about identifying a course or training programme applies to more short-term skills development, whereas if a staff member wanted to study for a degree to further their skills and knowledge, it would be a more involved process. ManagerG1 pointed out that a Master's or PhD would need firstly, to be relevant to the work they do and secondly, be aligned with Ocean and Coasts' strategic plan. ScientistG1 added to this by saying the short term opportunities might include short courses such as those related to communication, data management or something like a diving course. There are also short courses on the statistics programme, R, or on GIS. According to ScientistG1, 15 or 16 years ago there also used to be language courses available for marine scientists and managers, for example isiXhosa, and he inferred it would be useful to re-introduce these courses. He also mentioned legislative drafting courses which he described as "valuable for both scientists with an interest in it, and managers" (ScientistG1). Environmental Management Inspector or EMI training is another common opportunity that is taken up by managers and ManagerG3 specified that this training has been reduced to a one-month course, in a similar way to how the MPA training was reduced to run over a shorter time frame. In DEA's Strategic Plan for the years 2015/16 - 2019/20, it states that the medium term target is to have a total of 1560 EMIs trained by 2019/20 and this will include a combination of firstly, basic training to increase the current capacity and secondly, specialised training in various areas of environmental management to enhance the capacity and skills of the current EMIs. This would be across all branches, but it shows the commitment to EMI training at a higher level in the organisation, which could lead to enabling conditions for this type of training in Oceans and Coasts.

ManagerG3 mentioned that an incentive to attend the MPA management training programme is the certificate one receives if one passes, which is signed by the WWF coordinator and the

chief director of Integrated Coastal Management (ICM). He said the same applies to the estuaries training and EIA (environmental impact assessment) training. The EIA short course he spoke of is run through Rhodes University and Nelson Mandela University and ManagerG2 was of the opinion it is a really good course because it exposes one to "fresh ideas" on how to approach the development cases they have to deal with. By 'development cases' he meant the development of property along the coastline. These courses and training programmes are all formal, accredited opportunities and the emphasis on certification shows the priorities (and socio-material realities) of the staff at Oceans and Coasts. It was summed up well in a statement by ManagerG1: "Formal certificates and accredited courses are important, because on your career path, if you want to progress, you [will] go through an evaluation process, so all of your qualifications will count". This is not to say that informal opportunities do not have their place in an organisation like DEA, and it may very well be due to the fact that this was a group discussion so the more personal, informal experiences of the individuals were not mentioned. However, from what was gathered at Oceans and Coasts, the learning and agency was undeniably slanted towards formal, certified courses.

6.4.3 Agency associated with informal up-skilling opportunities/experiences and learning

The agency exercised by the scientists and managers at Oceans and Coasts is shaped to a large degree by the current challenges and responsibilities of the organisation. In terms of skills development, ScientistG1 said the ideal situation was if there was "convergence, where both [the] talents of the person and the needs of the organisation, and the aspirations of the person can combine". He added: "there's a lot of room given for staff with initiative" and if they seek out new trends in literature or want to attend a conference or workshop on an emerging, or current topic/technique, regarding the marine sector, "that is generally supported, if it is aligned to our function" (ScientistG1). Although the training he talked of here may not be informal, as defined in this research, the way in which he talked about an individual's initiative and aspirations, links to the discussion around motivation, will and personality that was explored in sub-section 6.3.3 of case study two in this chapter (i.e. SAIAB). These traits affect the learning and agency within an organisation and may determine what kind of up-skilling opportunities and practices the marine professionals find most useful.

6.5 Case study four: SANBI

As described in previous chapters, the Marine Programme at SANBI consists of a small but influential team of scientists and this, in itself, is a socio-material reality that needs to be considered when discussing the role of agency in the learning, skills development and training initiatives in the organisation. The interviewee, ManagerÉ1, described the Marine Programme as "a very small team that are working on a national scale," so from the outset, it was clear that there was a fair amount of pressure on the staff working on the programme.

6.5.1 Agency associated with socio-material realities and learning

The Marine Programme works on a number of projects ranging from data management to science-based advice and providing guidance to policy-makers, and ManagerÉ1 explained that funding for skills development or training can come from the budgets of the individual projects or from SANBI's further studies support budget. The SANBI human resources department annually ask for recommendations on what staff training or capacity development is needed and then make budget available, accordingly. However, ManagerÉ1 implied the financial resources are limited for both capacity development and salaries: "resources are scarce for us" and for this reason they benefit greatly from the NRF interns that come and work with them in the Marine Programme. In terms of the agency exercised by the scientists at SANBI, she said the upper management do not necessarily push staff to seek up-skilling opportunities and they are not "actively trying to get people to go study, the push is very much from the bottom up" (ManagerÉ1). It is worth noting that this seems to be the case for majority of the organisations included in this research and the discourse of up-skilling being dealt with on a person-to-person, or one-on-one basis, appears to be common. More will be said on this matter in Chapter Seven, but it could be proposed that the implications for learning involve individuals making the most of the agency they have in the workplace. It may also mean the up-skilling opportunities and practices will vary in significant ways from one individual to another, even within an organisation.

The agency of individuals will also be shaped by the projects they are working on and as was stated in Chapter Five, the published papers give some indication of what the professionals are dealing with, in their working lives. The 2005 paper that refers to rocky intertidal communities in KwaZulu-Natal would have required very different skills and competencies to the 2013 work on a marine biodiversity plan for the West Coast. In addition, the Marine

Programme heads up projects such as the Linefish IUCN Regional Red Listing and the Marine Alien and Invasive Species project. Knowing the technical details and working with all the implications of these projects requires a wide breadth of skills and an understanding of the relevant ecosystems, species and legislations. In addition, there are political and social factors to consider which may have national or even global effects, in some cases. As an explicit example of the knowledge requirements in a project, the Deep Seacrets project is described as follows on the SANBI website:

> This project aims to develop multi-disciplinary offshore research capacity and knowledge to support improved management of poorly studied outer shelf, shelf edge and upper bathyal ecosystems of the Agulhas Ecoregion. The study area is Knysna to Port Alfred in the 200-700 m depth range, within an Ecologically and Biologically Significant Area (EBSA).

This extract captures the intricacies of the socio-material realities in this project, where improved management is the goal but there is a great deal of technical knowledge required to research this exact subject of offshore ecosystems, in a particular region. Terms such as 'upper bathyal ecosystems' or 'depth range' are specific to marine science research and show how the material can include texts and discourse, which are significant and hold their own implications within a relational agency. This concept aligns with Barad's understanding of agential realism and materiality where meaning is derived from a process of 'mattering' and is formed when different agential possibilities are realised (Barad 2003).

6.5.2 Agency associated with formal up-skilling opportunities/programmes and learning

In a discussion on formal university degrees, ManagerÉ1 felt it was important to have a degree in her field, as that is how she believed people are judged in the scientific sector. She did her Honours degree in Biodiversity and Conservation Biology at the University of the Western Cape and at the time of interviewing, was completing a Master's in Environmental Management, through Stellenbosch University. The conversation then moved on to the courses she had done through UNISA on project management and through SANBI who ran two-day short courses on various subjects. She described these courses as very useful and she also mentioned a number of conferences that she found worthwhile, as they provide a "bite-sized" (ManagerÉ1) feel for what projects are happening and where. These conferences included the annual conference hosted by SANBI, the Biodiversity Planning Forum; the annual Ezemvelo Symposium; the WIOMSA conference and the symposium that made up Observation V.2, SAMSS.

The two-day short courses that ManagerÉ1 spoke of no longer exist but have been replaced with "in-house capacity development" (ManagerÉ1), where a SANBI employee with expertise in a certain area, will run a course or workshop. When SANBI require a study done in a certain field, or need data relating to a particular topic, they also offer bursaries to students who might be interested. ManagerÉ1 said this is a good way of achieving certain strategic goals in the Marine Programme. The formal up-skilling opportunities mentioned here, once again give an idea of how learning takes place in this organisation but in the following sub-section there are some insights that give a slightly different notion of the learning and agency associated with the opportunities already presented.

6.5.3 Agency associated with informal up-skilling opportunities/experiences and learning

The concept of mentoring has slowly taken hold in SANBI, according to ManagerÉ1, and in the last few years the organisation has recognised the benefits of mentorship for the existing staff members. Working in a small team will also have affected the relationships formed and ManagerÉ1 thought that she had learnt more in the last seven to eight years working at SANBI, than in the two years of doing her Master's degree. She said that through accumulating real world experience, such as working on certain projects, she has had to learn "on-the-job" and much of the skills and knowledge she has now are "very much self-taught". These phrases emphasise the informal up-skilling experiences that lead to valuable learning and the agency of the individual in these situations is proving to be crucial when evaluating the skills and knowledge in marine scientific and management contexts.

6.6 Case study five: CapeNature

Having met ManagerB1 at the Southern African Marine Science Symposium (SAMSS) that made up Observation V.2, I had already spoken to him in brief about up-skilling, training and workplace practices in the marine sector. His perspective as a manager at CapeNature was invaluable to this research and the many issues faced by conservation professionals were discussed during the interview. Being in a different biozone geographically and a somewhat different social and political climate, I expected the socio-material realities and agency associated with up-skilling opportunities in the Western Cape to differ from the conservation agencies in the other provinces. However, I did not allow these expectations to create bias in this case study and I allowed the findings to emerge through the semi-structured interview with ManagerB1, the documents and associated observations.

6.6.1 Agency associated with socio-material realities and learning

The agency exercised in the workplace and in his career was a key finding that stood out from the interview with ManagerB1 about training and up-skilling opportunities. He described his learning over the years by saying: "I believe in giving 200 % and I've learnt a lot". This might explain why he is a prominent figure in the marine sector of South Africa and why other participants in this research have described him as an example of a successful, effective manager. As was the case with some of the scientists at SAIAB and ORI, he gained experience while studying at Rhodes University and volunteered on projects that involved estuarine management. By taking the initiative and getting experience in the field, he started out his career with the knowledge and skills that may have been lacking had he not taken up these opportunities. On this point, he said that many individuals in the marine sector, and particularly the government departments, get put into management positions because it is the next step up in the career ladder but they are not given any training or guidance for the position. He also remarked on how most of the "young guys [in] CapeNature, or the young people in MPA management, are on contract because we get funding from DEA, national" (ManagerB1). This financial reality of the sector is probably one that makes the sector less attractive for young people considering a marine profession. For ManagerB1, the early stages of his career saw him working in the hunting industry in the Free State province of South Africa and in that role he had to manage a team of directors. On his time there, he commented: "I learnt a lot of management skills there… I wasn't getting paid accordingly but I learnt a hell of a lot" (ManagerB1). Here, again, he touched on the financial remuneration aspect of the job but also, how much he had learnt through the experiences in that position.

Having experience could be said to be essential when dealing with certain problems in the marine sector and one such issue for conservation agencies, like CapeNature, is poaching. In the Western Cape, in particular, the abalone and west-coast rock lobster populations are targeted by poachers and as reported by the Sunday Times newspaper, the rock lobster populations are declining at an alarming rate (Jordan 2018). This article also mentions the abalone corruption scandal of February 2018 and how WWF have submitted a court bid in an effort to save the rock lobster populations from possible extinction (ibid.). These reports of corruption add to the complex issues of illegal harvesting and law enforcement that marine and coastal manager have to deal with.

In relation to Operation Phakisa, ManagerB1 said that the one approach has been to increase the efficiency of the fisheries that exist along the coast and a large amount of money has been budgeted for buying equipment. This topic is a good example of a complex, socio-material reality that involves multiple, interacting factors. The equipment and gear that ManagerB1 spoke of, are tools in this situation, and are part of what can be defined as the material, as described in Chapter Three. As reported by Jordan (2018) in the Sunday Times news article mentioned above, many coastal communities turn to poaching as source of income and this introduces a social dimension to this problem. ManagerB1 and I also discussed the possibility that the equipment intended for legal fisheries could be appropriated and used for illegally harvesting abalone and rock lobster. In such a context, one could go on to discuss law enforcement, poverty, historical inequalities or the national policies that deal with fisheries, but the relations between the various elements involved here are so closely integrated that distinguishing them from one another becomes difficult. The human and non-human agency relation at work in this situation should also be recognised and such a complicated problem is not easily solved. Regarding Operation Phakisa, in general, ManagerB1 stated, "it's a challenge" and this was certainly true for the individual managers and scientists who were involved in this initiative.

We also spoke about Operation Phakisa with regard to offshore MPAs, and ManagerB1 said: "What South Africa needs to look at, is the costs and implications of managing those things". He expanded on this, saying: "it's going to cost millions, [even] billions… There's no human capacity… and that's the point. The functionality and success of a programme [like that] depends on the number of staff and the number of experienced staff; and the budget" (ManagerB1).

Here, he was emphasising that one needs to consider the viability of a project like Operation Phakisa, not only from a financial point of view, but also from a skills and training perspective.[14] Investing large amounts of money in a project does not guarantee its success if there are not enough qualified people to work on, and with, the project. It may be that even when the expertise does exist, the researchers and managers involved do not necessarily have enough time to fully dedicate themselves to the project's needs. This stems from what was

[14] In addition, there were no obvious references to human capacity or an increased need for training or skills development in the literature or documentation that was sourced for Operation Phakisa.

said by the scientist at DEA – Oceans and Coasts, about the requirements of Operation Phakisa coming ‘on top’ of their existing workload and comments like that of ScientistÄ3 from SAIAB, pointing out that there were only so many “hours in a day”. Of course, marine professionals might also consider the project an up-skilling opportunity in itself, especially if they have to work with professionals from different sectors and develop new skills, which would result in learning opportunities that may not have been there otherwise.

The insights discussed here allude to some of the socio-material realities faced by ManagerB1 during his time in the marine sector, but they also shed light on the learning and agency associated with his career as a manager in the sector. CapeNature also has a well-defined HCD Strategy and some insights from this document were presented in Chapter Five, however, it also mentioned challenges faced by the organisation, as a whole. The most worrying challenge listed was that the “existing HR function does not have the required capacity to drive the successful implementation of the HCD Strategy” (p.20) and that although there has been extensive planning and dialogue surrounding the need for human capital development in the organisation, the systems and processes to support the implementation of the strategy are lacking. This was one of the main reasons for the development of the national Biodiversity Human Capital Development Strategy: to provide wider, sectoral support to organisations such as CapeNature (see Section 1.1). This research into up-skilling opportunities and practices also contributes to developing a better understanding of the human capital development difficulties faced by organisations in the biodiversity sector, and specifically the marine sector, in this case.

6.6.2 Agency associated with formal up-skilling opportunities/programmes and learning

The formal opportunities ManagerB1 mentioned include an oceanography course at the Cape Peninsula University of Technology (CPUT) and an exciting new addition in the way of a coastal management course. ManagerB1 went as far as getting a Master’s and believed that formal qualifications are more important for the terrestrial field due to it being more well-established but that for the marine sector, managers should have the basic background of marine science and then the more practical skills and training, such as a skipper’s license. He also mentioned courses that were not specific to the marine sector but are still useful, for example the courses DEA offer on legislation or the intensive three-week EMI (Environmental Management Inspector) course. He said there was also a peace-officer

training course which has potential and is useful from the law enforcement angle of a manager's role. The topic of the WIO-COMPAS accreditation came up and we discussed the possible benefits of the certification levels aligning with course content at universities. ManagerB1 commented: "If the content or learning outcomes were similar enough, and a potential staff member had a few modules outstanding, they could then do the modules at CPUT and get a degree". This subject came up when discussing what qualifications are listed as requirements in a CapeNature job advert and ManagerB1 explained they often ask for the various WIO-COMPAS levels, if it is a marine position. For an individual to seek out these courses and qualifications, they will require the agency and the commitment that will see them completing the courses and finding a job in the marine sector, with the aim of becoming a marine professional. An example was given by ManagerB1 when he told me about one of his rangers who was one of his best, but had no formal qualification (other than a diving course and a South African Maritime Safety Authority certificate). ManagerB1 explained that to bring him up to speed with the marine and conservation side of the job, he sent him on the WIO-COMPAS course that was run at CapeNature in 2014. Unfortunately, the course was not held in the Western Cape again, after that. The socio-material realities associated with this dilemma of qualifications are numerous and it is essential that the 'possible professionals' are aware of the opportunities and experiences that can set them on the right path to enter the marine sector.

6.6.3 Agency associated with informal up-skilling opportunities/experiences and learning

The subject of having a keen interest in the marine field came up with ManagerB1 and he made comments such as: "It's all about the individual" when considering someone for a position in the marine branch of CapeNature. With regard to his management skills, ManagerB1 said: "I've just learnt it; but number one – you need to have the will… So, if you are interested". This can be said to be a re-occurring theme and one that will be discussed further in Chapter Seven. The same goes for mentoring and when asked about in-house training at CapeNature, ManagerB1 said: "Doing the work, and taking them with you". This form of apprenticeship or mentoring has value in that the person in training will quickly realise how important agency is and the socio-material aspects they will need to face, in this sector. By learning through experience, the individual develops the relevant competencies and hands-on skills needed for the day-to-day activities that the position will require. Another important factor to take into account, according to ManagerB1, was the physical abilities of

the person and how fit they were. This becomes a critical consideration in the marine sector when it comes to law enforcement and something like apprehending poachers, or monitoring the coastline. What ManagerB1 said about taking a person with you and training them through 'doing the work' aligns with a strategic objective from CapeNature's HCD Strategy about 'Talent Development' and an activity that it includes is to "implement successful coaching and mentoring initiatives, as well as other staff development initiatives as required" (p.18). The inclusion of the concepts of mentoring and coaching in the document is significant and although there may not be any formal initiatives, the recognition of these forms of learning is noteworthy.

ManagerB1 also mentioned the MPA Forum (Observation V.3) and how important it was for managers to communicate with each other: "What we are missing is a place where managers can learn best practice from each other" (ManagerB1) and he believed this should be the role of the MPA Forum. The communication skills he was referring to were discussed in Chapter Five and I raised the question of where such skills might be learnt. One possible answer could be that these skills are learnt through interacting with others and receiving guidance and support from those above or around you in the organisation. In the marine sector of South Africa, an enabling condition for the taking up of an up-skilling opportunity, could take the form of an organisation encouraging the marine and coastal manager(s) to attend the MPA Forum or other events such as relevant conferences or workshops. The learning that takes place at such events should not be overlooked and in the following cases, the topic of communication and learning from others will resurface as a significant aspect of up-skilling (or learning) opportunities and practices.

6.7 Case study six: WWF – Marine programme

Although WWF is an international NGO and is one of the world's largest conservation organisations, the Marine Programme in WWF-South Africa is relatively small, with a handful of managers that head up various projects. The findings from the interview with the manager of the Marine Programme, along with the supporting documents and observations, gave valuable insights into the agency associated with the formal and informal up-skilling opportunities in the marine sector and the socio-material realities that come into play are explored in the sub-sections below.

6.7.1 Agency associated with socio-material realities and learning

Much of what was said about the socio-material realities by ManagerH1 was similar to the findings in the other organisations and in the WWF Marine Programme they also work with a limited budget for training and skills development. However, if a manager of a project were to approach him asking to attend a course, conference or training event, it would be discussed and funding can be made available. ManagerH1 commented: "The challenge is, you have to identify the things yourself," meaning they are not pushed to go on any courses but agency is required from the individual and it will depend on their interests and motivations. This links with the idea presented by ManagerÉ1 in SANBI, where she mentioned up-skilling being driven from the 'bottom-up' in the organisation. If an individual is passionate about law enforcement they will most likely find or pursue opportunities that align with this concern. For example, ManagerH1 said: "I think what motivates me is a sense of wanting to… I get meaning from trying to fix things and make things work better" and therefore, he did his Master's on the line fisheries of the Cape, in the hope of making a difference to the lives of the fishermen. He explained: "That human element of wanting to try and make a difference for these guys, has always been something that motivated me" (ManagerH1).

In terms of furthering his studies while in the position or programme manager, ManagerH1 felt like he did not have the time or energy to do so and it would be difficult to stay "passionate and engaged" (ManagerH1) about his work, if he was also working on a thesis or research project. Time has been mentioned previously, but the notion of 'energy' or 'passion' limiting the learning and up-skilling of an individual, is an interesting viewpoint. We could ask the question of what implications there are when doing courses, training or furthering your education through doing a university degree, outside of the workplace or 'on top' of your day job. This would fall into the realm of 'learning *for* the workplace', if one considers the main research question of this study. ManagerH1 offered one suggestion, saying it needs to be clear in your mind, why you are learning or doing a course, and how this opportunity relates to your work.

> Some space needs to be given in your brain to saying: I'm going to learn about innovation in marine management with the idea or goal that I'm going to be able to take in something that I can then apply at work.

The example given by ManagerH1 in the above quote shows the motivation and commitment that is needed if an individual wants to get the most out of an opportunity or up-skilling event and this sort of thinking also hints at the professional agency that is associated with effective

learning, as well as a career in the marine sector. The idea of up-skilling opportunities being applicable and relevant to your day-to-day activities is one that, although obvious, is worth taking note of. Furthermore, the discussion presented above gives the impression that there is something about the marine environment (and working in the marine sector), in particular, that entails a level of engagement and passion that is not necessarily found in other jobs or careers. More is said on this theme and its connections to agency in the following section and in Chapter Seven.

6.7.2 Agency associated with formal up-skilling opportunities/programmes and learning

Agency can be described in many ways and particularly in this field of research, but for the individuals that took part in this study, the themes of 'being passionate' or having a strong desire to further your skills, are recurring. When talking about the participants of the MPA Forum (Observation V.3), ManagerH1 commented: "There is definitely a desire for people to build up their CVs and build up their experience… Most of the guys on that course are passionate, interested, and hungry for knowledge". The role of agency is apparent here, but the concept of building up one's CV also shows the emphasis on formal qualifications and at one stage, ManagerH1 suggested that government officials are especially focused on getting a certificate at the end of a course. This was a pertinent remark considering how much was said about certification in the group discussion held with DEA – Oceans and Coasts, and due to WWF working closely with DEA, the statement was probably not uninformed.

WWF provide partial funding for staff members to further their studies if they wish and ManagerH1 mentioned he did a post-grad diploma in environmental law, through the University of Cape Town (UCT). He also explained how the Marine Programme's administrator was supported to do a business management course through UNISA and one of the managers under ManagerH1 was doing a MBA (Master's in Business Administration) at the time of the interview. In another case, a manager had arranged to attend a third-year course in marine conservation at UCT. When it comes to doing a university degree, ManagerH1 believed it gives one good, technical, knowledge that might not be available in a short course and this knowledge is required for certain roles in the workplace. He said: "There aren't any that I know of, good courses which can summarise that learning" and continued, "We'd have to rely on the fact that they got those skills at a university, generally". Here, he referred to the managers or staff in the Marine Programme when he says 'they' and

from this point we discussed some of the qualifications of the staff. Other than those already mentioned, these degrees included a conservation biology Master's, Bachelors of Science – Agriculture, an oceanography Master's, law degrees, and a marine mammals Master's, to name a few. The degrees mentioned here give an indication of the knowledge and skills required by WWF as an organisation, as well as the socio-material realities that are associated with these marine professionals and the learning they have experienced.

6.7.3 Agency associated with informal up-skilling opportunities/experiences and learning

The document analysed for this case study was in the form of a guide to improved Workplace Skills Planning and it addressed informal learning opportunities in a section entitled 'Workplace based learning'. Here it stated that "some skills needs could be addressed through supervised learning in the workplace" (p.33) and it went on to mention on-the-job coaching, mentoring and peer learning. This serves as a good foundation for what was discussed in the interview around informal opportunities.

Despite ManagerH1 focusing mostly on the formal up-skilling opportunities and learning, he also gave one or two examples of informal learning opportunities. One such example was when he spoke about a scientist at ORI, who he described as "fantastic" and with regard to one of the projects, said: "He would provide comments and we would learn from that. So there's definitely learning like that" (ManagerH1). This topic emerged when discussing partner organisations and various relationships (or 'relatings' as described in Chapter Five), and notably, ManagerH1 also remarked: "Often you actually get better experience on-the-job". He went on to say that through their many partners and collaborations, they have the opportunities to learn from others and gain experience through these relationships. The repetition of the discourse surrounding experience and "on-the-job" learning is significant when examining the socio-material aspects of the marine sector and for WWF, this concept came through as meaningful, as in most of the other cases.

6.8 Case study seven: SANParks

The Marine Coordinator at SANParks has a science background but worked closely with the managers of the various parks and outside researchers. Therefore, the socio-material realities were somewhat different for her and thus, it was important that I also spoke with a manager from a park that included marine and coastal protected areas, like Addo Elephant National

Park. Through these two interviews I gained a well-rounded perspective of the agency, the socio-material realities and the formal and informal opportunities for learning and skills development in the organisation.

The strategic plan document that was analysed also contributed to the understanding of the skills development programme at SANParks. The inclusion of strategic objectives such as "promoting effective management of human capital" (p.33) showed the level of commitment to capacity building in the organisation and the document also stated that their approach was "one that ensures that all core areas of the organisational operations are not only occupied by internal and appropriately qualified employees, but such expertise is further developed and retained within the organisation" (p.14). It is clear from this statement that SANParks realised how HCD initiatives can lead to retention of skilled employees and that 'appropriate' skills are vital for the organisation. This discourse forms an important part of the socio-material and also influenced the learning that can, or does, take place in the working lives of the individual employees.

6.8.1 Agency associated with socio-material realities and learning

With both ScientistÇ1 and ManagerÇ1, the issue of funding for training and skills development was deliberated over during the interviews and ScientistÇ1 explained that if one wanted to go on a course or attend a conference, one would motivate to your senior manager or the HR department and it would be decided if one could attend. She said SANParks would not fund any overseas trips and sometimes not even regional ones, for example, if she wanted to attend the WIOMSA conference in East Africa. She commented: "It's all budget related and we all government institutions so we all essentially fighting over the same small slice of [pie]" (ScientistÇ1), in terms of the financial resources and other conservation agencies. She continued: "I guess SANParks is seen as, sort of the big-brother of conservation, so people look up to us [and] think it's so much better to work [here]" (ScientistÇ1) and she pointed out that although their salaries are a bit better than the provincial conservation agencies, she does not think the opportunities are that much better at SANParks. She added that an individual will not necessarily expand their horizons much more by being at SANParks, as opposed to CapeNature or elsewhere.

Sharing his thoughts on the way in which the budget is controlled at SANParks, ManagerÇ1 commented: "In the past it was a lot easier, when we controlled our training budgets… [The] training budget has [since] been centralised at head office". He went on to explain that they have to submit a training needs analysis but that by the time it has been approved, and the money allocated, the needs have often changed. This is one example of a socio-material reality that is related to the structuring of the organisation but another one would be the challenges faced by the rangers and managers who work in the parks, due to the fairly harsh environments in which they have to work and operate. ManagerÇ1 explained that often a ranger will have to stay on one of the islands when monitoring the area for poachers and he gave details of how many people would opt for jobs elsewhere, "with less of the intimidation and the hardship of staying on an island" (ManagerÇ1). He also brought up the subject of 'equity' in terms of race and gender, and when an individual is applying for a job in the park. In the example given above, he commented that it was often more complicated for women, because they cannot, or do not want to, leave their families for extended periods of time or to be on night duty. These challenges extend into the skills development opportunities and as was discussed in previous chapters, this issue links to organisational structure as well as the country's history of inequality, discrimination and segregation.

ManagerÇ1 also briefly spoke about Operation Phakisa and he agreed with ManagerB1, from CapeNature, that there was not enough human capacity to run Operation Phakisa successfully. His concern was feasibility of monitoring and management related to all the potential environmental effects associated with the scale of development of the 'Ocean Economy'.

6.8.2 Agency associated with formal up-skilling opportunities/programmes and learning

ScientistÇ1 and I spoke about how useful university degrees were and in her role as Marine Coordinator she mentioned: "I plan, I facilitate and a large part is stakeholder work… Which obviously, a PhD doesn't prepare you for" (ScientistÇ1). Here, she could also be talking of a Master's or any other university degree and the skills that are needed are most likely picked up through experience rather than in a formal course or programme. She also pointed out that most of the managers in the parks do not have degrees but will have a conservation diploma or something similar and ManagerÇ1 added that preference was given to candidates with a conservation background. The intern that was sitting in on the interview with ManagerÇ1

explained how she was doing a three-year diploma through Nelson Mandela University; it involves two years of theory and one year of practical. At this point in the interview, ManagerÇ1 speculated on how soon "our entry level field rangers will all have diplomas". She clarified this noting that there are a number of Universities of Technology producing approximately 30 students every year (ManagerÇ1) and how conservation diplomas are becoming more common in conservation agencies in South Africa. This idea of the junior managers or rangers having conservation backgrounds differs somewhat to what ScientistÇ1 had said elsewhere (see Chapter Five), about managers coming through from administration or tourism backgrounds but the reason for this might be that these two situations were happening in different contexts. This was not totally clear in the interviews, but it may be the case that in Addo Elephant National Park, the managers have conservation backgrounds, but in SANParks, more generally, the managers come from tourism or administration.

The MPA management training course is another formal opportunity that was mentioned in the interviews and ScientistÇ1 noted how the junior staff will probably get 'told' they are going on the course, whereas at the higher levels, one identifies training opportunities and motivates to go. The week-long, introductory course of the MPA training was popular among managers, according to ScientistÇ1 and she mentioned that it was "quite well recognised and supported by managers" whereas any longer period of time was problematic because "it means losing staff on the ground" (ScientistÇ1). This was dealt with in Chapter Five under the heading 'Organisational buy-in' although ManagerÇ1 contradicted the idea by saying it was well worth it, if the organisation is understanding and adaptive enough to facilitate longer term training. ManagerÇ1 said if there was an individual who showed potential as a park manager, he would send him or her on the MPA management training course; either the introductory course or the MPA manager's course.

6.8.3 Agency associated with informal up-skilling opportunities/experiences and learning

The discussions around experience versus formal qualifications continued with ScientistÇ1 saying that for the managers, it is not necessary that they have a university degree but rather:

> It's far more practical; it's whether you've run a park, whether you can run a budget, or if you can manage people… On the practical side, for the guys in the field, it's whether you can skipper a boat, or dive, or swim; whether you can do law enforcement.

She herself had also learnt through experience and with regard to drawing up management plans she comments: "through that process, obviously you had to have a stakeholder engagement process, so essentially I learnt on-the-job" (ScientistÇ1). An example provided by ManagerÇ1 was when an applicant for a vacancy had experience working with penguins at SANCCOB (the Southern African Foundation for the Conservation of Coastal Birds)[15] and this made ManagerÇ1 recommend this individual over someone with a diploma. However, he added there would still need to be some basic understanding of marine issues and specifically those pertaining to Addo Elephant National Park. He also explained how, when he came to the Woody Cape section of Addo, he already had experience in the marine field and knew the different species of fish, or what the catch limit was of a species, or which ones were threatened. With regard to specific details about a species such as the cob population, for instance, he said: "Of course I had to read scientific papers about how it is threatened and it's dropped by 5% in the last however many years and all that…" (ManagerÇ1), but he explained that ultimately, it was not a big transition into being a marine manager. These insights once again clearly show how important experience is and the concept of learning-on-the-job is a re-occurring theme between the various cases.

In conclusion, ManagerÇ1 gave his thoughts on conservation, saying: "So when I speak of conservation, the words that come to mind are: passionate, dedication, commitment" and in his opinion:

> It's very difficult to teach someone passion… And I'm a firm believer [that] if the person wants to, you can take any person from anywhere; if that person has got the calling… So that's difficult – that you can't train, no training course can [teach that]. (ManagerÇ1)

The intimation here is that to be a marine manager, you first have to be passionate about conservation and the marine environment. I would argue that, in a way, this could be equated to agency because it will influence the choices and actions of an individual and although there is more to agency than only this, it is certainly a factor to include when investigating the concepts of learning and agency in the workplace.

[15] SANCCOB is a non-profit organisation whose primary objective is to reverse the decline of seabird populations through the rescue, rehabilitation and release of ill, injured, abandoned and oiled seabirds – especially endangered species like the African penguin (https://sanccob.co.za/about-us/#do).

6.9 Case study eight: Ezemvelo KZN Wildlife

As a provincial conservation agency, Ezemvelo is largely state-funded but in recent years has been struggling, financially, so much so that one of the first things ScientistW1 said about funding in the organisation is: "all our posts are frozen at present because of lack of money." This paints a picture of the situation in terms of resources in the organisation and it is easy to understand from this comment that finding funding for skills development programmes, or training opportunities might then be limited or non-existent. Nevertheless, there do seem to be certain instances where funding is made available, but this does not take into account the social and political aspects that influence up-skilling opportunities and practice in, or for, the workplace.

6.9.1 Agency associated with socio-material realities and learning

The socio-material realities faced by the marine professional at Ezemvelo were hinted at in the introduction to this section, above, and following from this, the topic of positions in the marine field was discussed during the interview with ScientistW1. She pointed out that, "when you get into a position, you kind of stay… because you can't really move anywhere else" (ScientistW1). This was in reference to Ezemvelo specifically and she continued by explaining that the organisation was going to try and put mechanisms in place as incentives to stay in a position once appointed, such as an increase in salary if you advance your education through doing a degree. Unfortunately, this system was not implemented due to the financial difficulties of the organisation (at the time of conducting the interview). In relation to this subject, ScientistW1 said: "If they could get that in place they would keep people... Especially people in the lower levels like technicians; we lose a lot of people because there's no incentive [to stay]". In the marine sector, technicians play an essential role in the workplaces as they facilitate much of the fieldwork or data collection that the marine professionals rely on. These skills are often specific to the marine environment and this shows the importance of the material practices that take place in the marine sector.

ScientistW1 went on to discuss the learning that occurs, and skills that are developed, in the organisation by saying: "And actually we need people to stay in those positions because they know their areas, and they qualify, and they learn the systems; and then as they learn the systems, they leave…". This reality, along with the 'frozen positions', is one that will clearly affect agency and up-skilling that takes place in the workplace. This is generally a negative

situation for both the organisation and the individual, due to the fact that any learning or training that takes place is essentially wasted if the person leaves. A similar sentiment was expressed by the marine manager from SANParks in Chapter Five, when discussing investing in training for managers in the organisation who then leave after a short period of time. This problem was acknowledged by Billet (2000) who pointed out that often employers are reluctant to develop the skills of their workforce due to "concerns of facilitating their employees' mobility – of assisting them taking those skills to another employer" (p.274). Finding an effective solution to this challenge would require the organisation to somehow balance the risk of losing those skills with the benefit of a more efficient, knowledgeable and adaptable workforce.

When discussing the available resources in terms of human capacity at Ezemvelo, ScientistW1 commented: "I know our marine team need help; and technicians. But there just isn't the money". However, she also felt that this problem was not unique to Ezemvelo and that the government needs to budget more for more jobs in the marine sector. She gave the example of the marine team at SANBI, where the programme manager needed help due to the workload of the marine section but there was no funding to employ the additional staff. In ScientistW1's opinion, "that's ridiculous, that you put all that burden on one person, when you've got people out there that could help but you just can't hire them". This highlighted the issue of human resources as well as financial resources and in this case, the one is intertwined with the other. Many of these concerns are material in nature, but are also closely linked to the environment or ecological context in which the professionals are operating. For example, Operation Phakisa aims to promote and invest in the 'ocean economy' and includes a number of projects that require specific skills sets for the marine and coastal ecosystems involved. For ScientistW1, the relevant skills included geo-spatial mapping and considering the development of new MPAs.

6.9.2 Agency associated with formal up-skilling opportunities/programmes and learning

Despite the financial difficulties in the organisation, an individual can still exercise their professional agency in terms of their learning, and ScientistW1 mentioned: "you can put a training request in and they will try and find the funds, especially if there are a few of you wanting to do a course.". These courses could be in statistics or, like the ones that ScientistW1 had been on, GIS. Through Ezemvelo, she had also done a course on Marxan

which is the name of spatial planning software that she needed for her work. The organisation further funded her Master's in Science which she has been doing part-time through the University of KwaZulu-Natal, so it is not the case that there is no funding available whatsoever; possibly just that it is not easy to come by.

Having recently got her Master's and considering she had attended some formal up-skilling opportunities like those mentioned above, we discussed the importance of qualifications for some time. In terms of having a science background, she said that it depends which job you are in, or going into, and for someone like a technician, having a degree is not essential. However, in her position, it is a necessity and she explained:

> When they had a change of structure and they put me into the Marine GIS position, I was required to have a Master's. But obviously I'd already been acting in that position for so long… So that's why I started the Master's and they helped me work towards it. But it depends who you are, I think. (ScientistW1)

Here, she referred to the re-structuring of Ezemvelo at a larger scale, but I would propose that what can be taken from this quote, is how she had experience with spatial planning and conservation, prior to doing her Master's and although that has been a valuable learning experience, it was more a requirement from the organisation's side than from hers, as a marine professional. We went on to briefly discuss when an individual should "stop" studying if he/she wanted to get a job in the marine sector (outside of academia), and how becoming over-qualified can occasionally be detrimental. On this, she remarked: "If you can't find a job it makes sense to continue studying but then it's not always in your favour" (ScientistW1). This idea of becoming over-qualified goes against what is commonly accepted as a linear, rational process; where an individual would acquire the formal qualifications in their field of interest, and then find a job. It also relates to how much experience the individual has and how this is sometimes recognised as *as important*, if not more so, than the formal degrees or certificates the individual holds, at least for the marine sector of South Africa.

The document analysed for Ezemvelo KZN Wildlife was entitled: Five Year Strategic Plan and Performance Plan (2009-2014), and the table under the section 'Employee Learning and Growth' acknowledged a lack of mentorship and coaching programmes as well as leadership development programmes, but went on to list a strength in this area as having "a skilled and experienced workforce" (p.39). This hints at informal learning opportunities but by referring to mentoring *programmes*, it could be considered a formal opportunity. Either way, it is

interesting that this document brings in this aspect of training and skills development and in theory, the organisation should then promote mentoring or coaching relationships in the workplace. The notion of a skilled and experienced workforce may have been true at the time of publishing the document, but it is hard to say whether this would still be the case (see comments on out-datedness of this document in Chapter Five) and if it would hold true across all sections of the organisation. Although brief, these insights make valuable contributions to the findings for this case study and inform the conclusions that can be drawn about the learning, as well as the up-skilling opportunities and practices in the workplace.

6.9.3 Agency associated with informal up-skilling opportunities/experiences and learning

The issue of recognising experience over qualifications was also touched on when discussing the interns that come and gain work experience at Ezemvelo. In Chapter Five it was mentioned that these interns often leave and cannot find an available position in the marine sector but at least they have the experience and know more about the day-to-day functioning of a conservation organisation. ScientistW1 was of the opinion that these interns would leave having learnt a great deal and she was hopeful that they would pursue a career in the biodiversity sector thanks to their experiences at Ezemvelo as interns. For marine professionals on the whole, the agency, learning and dedication associated with the workplace seem to be key elements for the success and continuation of their careers in these marine and coastal organisations in South Africa.

6.10 Case study nine: WESSA

In Chapter Five, it was discussed how WESSA is different from the other organisations that form the case studies in this research. The marine programmes that they run, under the EcoTourism Unit of WESSA, are highly dependent on funding and much of the discussion with the general manager focused on this socio-material reality that he has to deal with and the agency that is involved in managing the projects/programmes.

6.10.1 Agency associated with socio-material realities and learning

The risk associated with taking a manager away from a project for training and skills development was discussed in Chapter Five, but to highlight this issue from an agency and socio-material perspective. ManagerN1 explained: “The way a project runs, is you have a

specific amount of funding over a specific amount of time; so to run any training during that project, you are putting the project at risk". With regard to the limited time they have and the development of a new project, he pointed out the following: "The tricky thing is, trying to find time to focus on developing a proper research plan for our science; and what are the objectives or the questions we want answered" (ManagerN1). This process of planning a project is an important one, but does not leave much time for training or taking up learning opportunities prior to the commencement of a project. As mentioned in Chapter Five, we also spoke about running projects in the "coastal space" and how, as the manager of the EcoTourism Unit, he was focused on blue economy jobs and any projects that the government was promoting. This topic highlights the materiality of this sector by acknowledging the potential for job creation and sustainable use of the oceans surrounding South Africa or the country's coastal areas. Ideally, there will be conservation benefits, as well as social benefits to such projects and this is where a socio-material approach is applicable and most useful.

The suggestion of WESSA shifting to a business model to run the projects was put forward in Chapter Five and ManagerN1 believed this could allow the projects to "remain financially stable, which leads to developing staff and offering opportunities that might not have been there otherwise. It's a reality that projects come to an end because you are relying on funders" (ManagerN1). If the project was generating its own profit, the reliance on funders would be less critical and ManagerN1 summed up his thoughts on this by saying: "A better approach might be to encourage people to form business units and use their skills to produce a sustainable business model". This would require agency from the managers involved and the sayings, doings and relatings, as well as the socio-material realities, would be completely transformed if this approach were to be taken. The implications for the skills and knowledge requirements would also be substantial and a background in marine science may no longer be necessary for managers running these projects. In the sub-section below this alternative approach is explored further.

6.10.2 Agency associated with formal up-skilling opportunities/programmes and learning

With regard to the formal qualifications that ManagerN1 might look for in a manager, he said WESSA has learnt "some hard lessons" where they have employed people with a background

in the natural sciences as project managers, but they have not had the relevant skills "to effectively manage a project" (ManagerN1). The nature of the marine projects at WESSA are such that the management skills are foregrounded and an individual with a university degree may not be equipped to deal with the challenges that arise. To explain in more detail, ManagerN1 said:

> My mindset has changed quite a lot since being with WESSA and working on a project like this. In that, most of our skills are environmental sciences, environmental education, the natural sciences. But really, it's proved to be a major weakness in our operational model, in that, all of the hard skills we need are project management related skills, rather than environmental skills.

The fact that he mentioned 'hard' skills here shows that the required skills are hands-on or more practical skills, in terms of managing a project. These might include skills like managing a budget or knowing how to hire the right people, or put together funding proposals. This links back to what was discussed in Chapter Five about him looking for someone with the technical skills in project management if he were to have to hire another manager. I would speculate that this could either be in the form of an individual with a business or management degree/diploma, or it could be someone with experience in developing and running projects similar to those in the EcoTourism Unit of WESSA.

6.10.3 Agency associated with informal up-skilling opportunities/experiences and learning

Following what has been said about management skills, the notion of having appropriate experience rather than a formal certificate or degree can be discussed. When asked where or how an individual can learn the necessary skills, ManagerN1 replied that in his case he would consider taking a staff member who is not in a management position and allow them to "shadow" a project manager, so a mentorship in many ways. He also commented: "The real skills are something a course isn't going to teach you, so perhaps on-the-job training is probably a better bet for us right now" (ManagerN1). From his own experience, he says the most valuable learning occurred after he had finished studying and got work experience running a small consultancy company; "definitely, all the management skills and experience I picked up from that" (ManagerN1). He described this time and gave some examples of the skills, as follows:

> It was literally just being out there; responsible for accounts, being responsible for certain clients and facing the fire that the client brings to you, rather than any supervisor or lecturer. So it was the industry that gave me these skills, I believe that quite firmly.

This relates to what ScientistR4, from ORI said about “trial by fire” and both these descriptions illustrate the intensity of the learning experience in these situations and as with many of the other participants, ManagerN1 re-iterated how meaningful on-the-job learning is. The way in which he talked about skills, and the agency that he alluded to, makes one realise that the socio-material realities in his position at WESSA are not the same as those at the other organisations or institutes, but are still as influential on the learning that occurs in, and for, the workplace. The various roles of marine professionals will also determine which up-skilling opportunities and practices are most useful and to what extent professional agency plays a part in their learning.

6.11 Summary of findings

The key findings from Chapter Six are summarised in Tables 6.2.1 and 6.2.2 that follow. These tables show the main trajectories coming from each organisation with regard to the learning as related to the other themes that were dealt with in this chapter: the socio-material realities; formal up-skilling opportunities or programmes; and informal up-skilling opportunities or experiences. Table 6.2.1 summarises the findings from case studies one through to five, while Table 6.2.2 looks at cases six through nine. As can be seen, the findings across all nine cases remain close to the original accounts from the participants but the trends or patterns are discussed further below. Not apparent in Tables 6.2.1 and 6.2.2 is the vital role that agency plays and how it is associated with all aspects or themes mentioned below. This is not meant to imply its insignificance but for the sake of summarising the key findings, it is assumed to be present in all findings throughout Chapters Five and Six.

Table 6.2.1: Summary of key findings for each organisation (ORI, SAIAB, DEA, SANBI & CapeNature)

	ORI	**SAIAB**	**DEA**	**SANBI**	**CapeNature**
Learning and…					
- the socio-material realities	Being out at sea or interacting with fishermen is a material practice where much learning occurs	The scientists seldom have enough time for up-skilling on top of their other responsibilities	The issue of workloads and time constraints was discussed	Funding for up-skilling comes from individual projects, generally	Contract positions (due to the funding structures) are not very attractive
	For researchers involved in a field such as fisheries, a university degree is not that useful due to the hands-on nature of the work		A reduction in funding to the Department also effects the capacity for up-skilling	The drive for up-skilling is bottom-up (comes from individuals not management)	Operation Phakisa is not well thought out due to the lack of human capacity available
	Financial constraints in terms of salaries and project funding				
- formal up-skilling	Registering as a professional scientist is important.	Certain skills/certificates are needed for fieldwork such as a skippers license or diving qualifications	Short courses are available to staff	University degrees are seen as important and conferences are worthwhile for staff	There are marine-specific courses run at the Cape Peninsula University of Technology
	The assumption is that a university degree is essential for a marine professional but this is not always the case	Non-accredited workshops can be highly beneficial for developing skills and knowledge	Doing a university degree is also possible but it must align with the work the person is doing	Previously, there were two-day short courses available which were useful	
- informal up-skilling	A strong emphasis on learning-by-doing and taking initiative to advance in your career	Fieldtrips and work experience early on in their careers often sparked a keen interest in marine/estuarine ecology	Staff who show initiative and can motivate for attending workshops or conferences are accommodated	The abovementioned courses have been replaced with in-house capacity building (courses or workshops)	Having the will and interest in marine ecology is a key factor to take an individual forward

	Mentorship is important in the sector	Individual relationships are important for knowledge-sharing and learning opportunities		Mentorship is becoming more popular at SANBI and is recognised as worthwhile	WIO-COMPAS levels do not align with university degrees but this option should be explored for the sake of accreditation
	There is a need for more RPL initiatives			Many skills have been self-taught through experience	

Table 6.2.2: Summary of findings for each organisation (WWF, SANParks, Ezemvelo & WESSA)

	WWF	**SANParks**	**Ezemvelo**	**WESSA**
Learning and…				
- the socio-material realities	Work such as improving the lives of fishermen is meaningful for ManagerH1	Job specific challenges include anti-poaching patrols and over-night duties in harsh conditions	Once in a position there is little room for growth due to the financial state of the organisation	There is limited time for the planning process when running a project at WESSA which is problematic
	It should be clear why doing a course is important and how the opportunity relates to your work	The budget has been centralised so there is less control for each Park over funding for up-skilling	Skills and knowledge that are specific to the marine field are often lost because there are no positions open or incentives to stay on	
	Time and energy for up-skilling are limited	Budget does not allow for international conferences	Additional staff are needed but budget does not allow	
- formal up-skilling	Course, conferences or training must be identified by the interested individual	The week long, introductory course of the MPA training is popular among managers	For many positions, a university degree is required and Ezemvelo will find funding for these	Natural science or conservation degrees are not necessary for the type of work that is done by WESSA
	A degree or diploma gives you good, technical, knowledge that might not be available in a short course	Conservation diplomas are becoming more common; these are often more useful than an administration or tourism background	Courses that are directly related to an individual's work are supported (for example: Statistics or spatial modelling courses)	A business, or financial management course or degree is preferable
- informal up-skilling	"On-the-job" learning and relationships with mentor-figures were said to be meaningful	Field experience and practical skills (such as law enforcement or diving) are essential but some technical knowledge is also required.	Internships are worthwhile in terms of the experience gained in marine/coastal environments	Valuable learning occurred through work experience and through meeting the needs of clients
	Supervised learning in the workplace was a concept mentioned in the relevant document	It is critical that a marine professional is passionate about their job and this cannot be 'taught' in a course		ManagerN1 recommends job-shadowing or mentorship in order to learn the necessary managerial skills

The findings for ORI in Table 6.2.1 expand on those presented in Chapter Five but here the focus is on how the marine professionals interact with the material aspects in their working lives. The emphasis on real-world experience and the importance of communication and relationships (both with fishermen and with mentors) is apparent and this is also touched on the informal theme at SAIAB. The findings for SAIAB were centred on the practical qualifications that may be necessary (such as a skipper's license) but also included the time constraints of the SAIAB scientists. Funding and financial limitations are mentioned in nearly all cases (including those in Table 6.2.2) and DEA was no exception. At both DEA and SANBI, there was reference to the staff development initiatives being driven by the individuals and also how certified short-courses or university degrees were important ways of up-skilling in these organisations. The findings from CapeNature were similar to those of other cases but in addition the aspect of 'will' to progress in your career was highlighted.

Table 6.2.2 presented WWF first and again the issue of limited time was mentioned. The manager pointed out that diplomas or degrees form a good basis of knowledge and skills, something that an individual may not necessarily get in a short-course. Under informal opportunities, "on-the-job" learning is listed as a key finding, along with relationships with mentor-like figures. This is also referred to in the documentation that was analysed for WWF. SANParks had a number of points that resonated with other cases, such as the unique material aspects of the profession and the financial limitations faced by the organisation. However, under formal opportunities in this case, the MPA training course was discussed, as well as how conservation diplomas are useful for individuals entering the workforce at SANParks. For informal opportunities the topic of being passionate was also cited as essential. For Ezemvelo, the socio-material realities included the financial constraints, once again, but it was pointed out that funding for university degrees or specific course was made available. The role of internships is also discussed with the participant at Ezemvelo. Lastly, WESSA is summarised in Table 6.2.2 and here there is an emphasis on formal opportunities and what types of degrees or diplomas are most useful to WESSA. Due to the focus of WESSA's work being on project management, it was recommended that learning through experience or job-shadowing were worthwhile.

The summary provided here is not a detailed discussion of the findings but it allows for a re-focusing of what emerged from the data in Chapter Six and it forms a basis for further

exploration of the key concepts mentioned. Conclusions that can be drawn from these findings are outlined in the following section where the differences and similarities between cases are outlined, and specific examples from the findings are presented. The findings are also re-interpreted by making links to the four-planar social being/Social Cube in Table 6.3 (Section 6.12.1).

6.12 Conclusion

What is most interesting about the findings in Chapter Six is that despite the differences between the socio-material realities at the various organisations, almost all of the participants concluded that experiential learning or informal opportunities have been of great value to them (refer to Tables 6.2.1 and 6.2.2). Formal qualifications and learning opportunities tend to be more easily recognised and for many marine professionals, a university degree is the recommended starting point for their careers. This is understandable when considering the research institutes (ORI and SAIAB) who have close ties to academia and the professionals have studied marine, coastal or estuarine science to get to where they are. So in general, scientists are well-qualified on paper but it could be said that this is not always a true indication of the learning that has occurred throughout their working lives. Certification is at the core of this discussion and although more is said on this subject in Chapter Seven, here it is worth considering the link to incentives and ultimately, retention in the marine sector.

The Biodiversity HCDS includes retention as one of its strategic goals and admits that this is an issue that requires attention (SANBI/Lewis Foundation 2010). It also acknowledged that organisations in the biodiversity sector have to work harder to retain talent, due to the high rates of mobility and competition. As discussed with the participants in this research, there are substantial financial, as well as time constraints in their marine and coastal organisations (see previous section including Tables 6.2.1 and 6.2.2) and incentives were mentioned by ScientistW1 from Ezemvelo, in particular. Bearing this in mind, certification, retention, incentives and the learning that occurs throughout this process are discussed below.

It has been proposed that opportunities for certification, especially for junior or mid-level professionals, can act as incentives when financial rewards are not possible: “This is a feasible alternative to increasing salaries, as the latter is often constrained by limited budgets”

(Squillante et al. 2010, p.287). By certifying staff members there is the hope that they will remain in the profession and develop their skills further (ibid.). In addition, if national governments incorporate certification into a broader professional development system, the result may well be the retention of staff through motivation and recognition of skills (Sisitka et al. 2013). The skills that are put to use in the marine sector have been shown to be specific, yet numerous, and the material practices that the marine professionals engage with are not necessarily easy to measure. These factors complicate the process of certification, assessment and relevance but it should be noted that the learning processes of the marine professionals are of real concern in the end. The findings from Chapters Five and Six resonate with the point that Eraut (2004) made when he says:

> Most respondents still equate learning with formal education and training, and assume that working and learning are two quite separate activities that never overlap, whereas our findings have always demonstrated the opposite, i.e. that most workplace learning occurs on the job rather than off the job. (p.249)

The overlap between working and learning that he mentions is clearly visible in my research into up-skilling in the marine sector and I would argue that the importance of materiality in the marine and coastal environments makes this overlap that much more pronounced. This is expanded on in the following section (see Table 6.3; plane [a]). Social and material relations are recognised by Fenwick (2010b) as fully entangled with work life and in Chapter Three, I compared the way Fenwick views these entanglements, to how practice theory includes the material in the 'doings' of the practice architectures. Kemmis et al. (2009) describes these material-economic arrangements as playing a part in shaping the conduct of the practice in question and in this research that would be the learning, up-skilling and professional development in marine and coastal organisations. The social relations of course, come through in the 'relatings' which hold power in the social space of the practice.

In the narratives of the participants there is an underlying notion of adaptability and this influences many aspects of how the professionals in the marine sector of South Africa learn and take part in work activities. It seems like the job roles change over time and as the individuals gain experience, they are given more responsibilities. Not only this, but with the development of new technologies and innovative problem-solving strategies, the marine scientists and managers need to be pro-active in learning and staying up-to-date with these changes. There are also changes in the conditions under which they work, both in terms of the ecosystems/natural environment, such as dealing with the effects of climate change, and with

regard to political environments. Gherardi (2012) pointed out that "practitioners adapt their activities to changing contexts, and it is this situated rationality that constitutes their logic of practice" (p.18) and I would add that this is a skill that may not always be clearly identified. Linked to this idea of the scientists and managers being flexible, adaptive professionals, are the quotes in this chapter such as, getting a "hands-on feel for the situation" (ScientistR1) or those about learning through experience.

6.12.1 The Four-planar Social Being Model

In the introduction of this chapter, Table 6.1 made initial links between the sayings, doings and relatings from Chapter Five to the four-planar social being/Social Cube as a way of synthesising the findings presented up until then. Table 6.3 below takes the same approach by illustrating how the Social Cube can be used to interpret the findings from Chapter Six. Linking the four planes to the findings allows for broader and more meaningful conclusions to be drawn, which also resonate with the layered ontology of critical realism. A discussion of these interpretations is presented below the table.

Table 6.3: Links between Chapter Six and the Four-Planar Social Being Model (the Social Cube)

Planes of the Social Cube	**Explanation**	**Examples from the data**
Plane [a] – material transactions with nature	With a focus on socio-materialism, Chapter 6 clearly relates to plane [a] due to the uniqueness of the marine ecological context or environment wherein the up-skilling practices and professional learning take place. Although time and financial constraints were often discussed, from the opportunities outlined, one can see that very specific skills and knowledge are required due to the socio-material realities in the marine sector.	Skippers license; diving qualifications; firearms training; maritime safety training; first aid; WIO-COMPAS certification; effectively communicating with scientists or managers, interpreting scientific findings on certain marine issues; interacting and communicating with fishermen or the commercial sector
Plane [b] – inter-intra subjective relations	Much has been said on the role of one-on-one relationships and unofficial mentors who have supported or inspired the marine professionals that participated in this study. These inter-subjective relations influenced and led to the up-skilling opportunities and practices discussed. In addition, the passion or drive that an agent finds within him/herself to work in the marine sector and advance their career was found to be a re-occurring theme.	Role models or mentors were either in the form of a supervisor, colleague or associate. But these relations were often turning points for an individual's career path. The topic of *will* or having a keen interest in the marine/coastal/estuarine environment. Being passionate about their work was highlighted as a necessity by multiple participants.
Plane [c] – social relations	The relations between and within organisations could enable or constrain the available learning opportunities and possible collaborations. Organisational structures also determined what was possible in many cases. The way the professionals operate within these structures and deal with the relations, will influence how they engage with up-skilling opportunities and practices in their workplaces.	DEA – Oceans and Coasts was a highly influential player due to them being the national department and organisations like SANBI, WWF and SANParks had close ties with DEA. Professionals often used conferences as a space to initiate partnerships, collaborate and share information in a strategic way. The centralised budget of SANParks is an example of internal structures that affect up-skilling opportunities or training.
Plane [d] – subjectivity of agent	A theme that permeates all layers of this research and that also appears in the examples of plane [b], is that of agency. 'Being passionate' has been cautiously equated to agency, so it can be said that the characteristics of the agent and their sense of self are powerful factors that will drive up-skilling.	The past experiences of the participants made them the marine professionals they are today; in many cases it was the skills learnt through working life that they valued the most. The initial interest as well as their personalities shaped their careers (such as a manager communicating effectively with a scientist or vice versa).

Table 6.3 aims to make explicit the links between the findings from Chapter Six and the TMSA or Social Cube, described by Bhaskar (see Section 3.2.3 of Chapter Three), through summarised explanations and examples from the chapter. The Social Cube is constituted of the four-planar social being model which includes spatial and temporal elements. Although these are not made explicit in Table 6.3, they are critical underlying elements of any social event that is under investigation. The time and space in which an event occurs, needs to be recognised, not only for the sake of understanding context, but also due to their influence on all four planes of being.

The link between plane [a] – material transactions with nature, and the findings from Chapter Six is clear and the examples given in Table 6.3 give an idea of what the socio-material realities consist of in the marine sector. The use of the phrase "transactions with *nature*" also resonates well with this research due to the marine and coastal ecosystems being the environments of interest, for the professionals in the nine case studies. Plane [b] includes the relationships as well as internal relations of the individuals involved. There are many references in Chapters Five and Six, to the importance of good relationships, between managers and scientists, or between colleagues. The intrasubjective relations can be equated to the sense of passion or 'will' to advance one's career, as pointed out in the examples provided. The social relations of plane [c] can be seen in the way the organisations interact with each other and the partnerships that are formed. The structuring of the organisations is important for this plane and this will also depend on whether they are governmental departments, provincial conservation agencies or NGOs.

Agency is also critical for all four planes and in the explanation of plane [d] – subjectivity of agent, the significance of agency is specified. Here, it is linked to the concept of being passionate and how this could be intrinsic to the individual. This is discussed further in Chapter Seven but it should be noted that in fact, all the up-skilling opportunities and practices described in Chapters Five and Six, are closely affiliated to agency.

CHAPTER SEVEN – Exploring the generative mechanisms that shape the up-skilling opportunities and practices, as well as the learning and agency of the marine professionals

7.1 Introduction

Chapter Seven pulls together the findings from Chapters Five and Six by discussing them using a critical realist perspective and uncovering what deeper mechanisms are at work when considering up-skilling opportunities and practices in the marine sector of South Africa. The learning and agency of the marine professionals who participated in this research will contribute to the discussion of the experiences, events and mechanisms that were encountered in this study. The research sub-question that this chapter addresses is:

> How do generative mechanisms shape the constitution and enactment of up-skilling opportunities and practices, and the learning and agency of marine professionals?

As the final chapter, it will also engage with the main research question of this study, which is:

> How do up-skilling opportunities and practices enable learning in, through and for the workplace, by marine professionals?

Chapter Seven aims to synthesise what has been investigated in all previous chapters and will shed light on the dynamics of the socio-material in relation to practice theory as well as critical realism. Due to critical realists understanding the world as differentiated and as stratified, where different layers or strata of reality exist (Danermark et al. 2002), the up-skilling opportunities and practices that were described in Chapter Five can be cautiously considered as belonging to the empirical domain, in which the experiences are observed or measured through the sayings, doings and relatings of practice theory (see Tables 5.1.1 and 5.1.2 at the end of Chapter Five). In Chapters Six the experiences and up-skilling *events* can be seen as coming together in the domain of the actual and within this stratum of reality, the importance of the socio-material is highlighted. Chapters Five and Six can therefore be seen as representing the phase of the research where induction and abduction is employed and the level of theoretical engagement moves beyond only producing thick description of the empirical entities, while keeping in mind that the chosen theories are fallible (Fletcher 2016). By taking this approach to the findings, I can then go on to use retroduction to explore the

generative mechanisms which will explain the experiences and events, as reported in Chapters Five and Six.

After discussing the mechanisms at work in this research, the summative perspectives are outlined and a number of recommendations are made. These recommendations are not only for the biodiversity and environmental sectors, but also for the organisations and individuals involved in this research, policy-makers, such as the Department of Higher Education and Training, as well as the relevant Sector Education and Training Authority – the CATHSSETA. With such diverse stakeholders, the recommendations are carefully set out with the hope that they will be taken forward and used in future human capital development research or in the implementation of policies and procedures in the biodiversity sector.

Towards the end of the chapter, the limitations of the study will be identified, possibilities for future research will be suggested and finally, the contributions to the field will be considered.

7.2 Exploring the phenomenon that is up-skilling: The available opportunities and existing practices

The sayings, doings and relatings of practice theory proved to be most valuable when taking an initial look at the up-skilling opportunities and practices in the marine organisations that were included in this research. Practice theory and the resulting architectures that emerged, allowed for detailed analysis of the data collected from the organisations. By using practice theory as the primary analytical tool, the relevant and significant findings came into focus in Chapter Five (see summary Tables 5.1.1 and 5.1.2). The commonalities and differences were highlighted between case studies and the findings were discussed. This led to a clearer picture of what up-skilling opportunities and practices exist in, or for, the marine sector and how the professionals in the sector learn, or make use of these opportunities in a meaningful way. Rather than merely listing the opportunities and practices that were mentioned across the case studies, I will discuss the *experiences* or opportunities that came through as being significant to the individuals in the marine organisations, as well as those that were common to most of the cases. Through loosely positioning these findings within the empirical domain of reality, the foundations can be laid for further discussions around the events of the actual and the generative mechanisms that enable these events and experiences.

7.2.1 The experiences of the Empirical domain

The critical realist's empirical domain of reality is seen as the most accessible to human understanding as it contains the facts and observations that mediate our theoretical conceptions (Danermark et al. 2002). This layer of reality consists of knowledge that is fallible and unstable, especially in the social world and it is for this reason that the researcher needs to be particularly aware of the assumptions and limitations of the study (Mingers 2004). In this research, the findings that are presented in Chapter Five constitute this knowledge that is 'fallible and unstable' but through in-depth exploration of the sayings, doings and relatings, the up-skilling opportunities and practices that are relevant to the research questions of this study can start to be discussed. The four planes of Bhaskar's Social Cube were also considered when summatively considering the findings of Chapter Five. By adding this layer of synthesis, the data was expressed in a more meaningful way and the role of agency became clear.

The sayings that were significant in the data resonate with planes [a], [b] to some extent, and [d] of the four-planar social being model (see Table 6.1 in Chapter Six), in that: the discourse surrounding the importance of the ecological-material aspects of the marine sector came through was prominent (plane [a]); intra-subjective relations could be seen in the way individuals spoke of driving their own up-skilling or learning (plane [b]); and the discussions about being passionate, interested and adaptable in the marine workplaces show how the subjectivity of the agent plays a major role in the taking up of up-skilling opportunities or practices that lead to professional development (plane [d]). An illustration of how the sayings influence the careers of individuals in the marine sector can be found in the two research institutes that were included in this research, ORI and SAIAB. These institutes shared similar mission statements that included sayings such as: biodiversity; marine resources; knowledge; education; conservation. In addition, SAIAB uses the phrase, "to serve the nation" in their mission, whereas ORI refers to "the benefit of all" (see Chapter One, Section 1.6 for full descriptions). The similarities in the discourses of these statements are noticeable and give a good indication of where the focus of the marine professionals lies in these two cases. The majority of the scientists interviewed for this research were at these two institutes and they all had scientific backgrounds, however, many of them also had experience in management, in one form or another. The inverse was true for the managers in some instances too. It is therefore, not surprising that the experiences these individuals described in the interviews have shaped their careers, their workplace relationships and their professional identities. For

some of them, even their childhood aspirations seem to have set them on a path to the marine sector. The up-skilling opportunities and practices, along with their experiences in the field and with other marine professionals, have resulted in them arriving at the time and place where they are being interviewed as marine *professionals*.

One pivotal saying that is worth drawing attention to, was the director of ORI's metaphor of 'watershed moments' and this held fast in my mind as a concept that describes well how certain experiences were turning points, or defining moments, for the individuals and their careers. In the case of the ORI director, he was referring to past experiences where he found himself in a fairly unexpected situation and new knowledge and skills were required, such as setting up a research facility or business management skills. The way in which he learnt these skills often involved other people and he referred to "true mentorship" with regard to learning from the people that were around him. This then leads us to the relatings that came through as relevant and certainly one of the most noteworthy aspects of the marine professionals' practices were the relationships between individuals, as well as the different organisations. There were clear associations with agency; power and learning within these relationships and the connection to the plane of social relations (plane [c]) were obvious in this way. The concept of power in personal and organisational relatings also links to plane [b] – inter-intrasubjective relations (see Table 6.1) and more is said on the importance of relationality in Section 7.4 (see Mechanism D).

In Chapter Five, it was proposed that the encounters individuals have with more knowledgeable others, or co-workers, instil a sense of passion and meaningfulness in the work and workplace practices they take part in. These encounters reflect the agency that can lead to transformation or reproduction of social forms (Bhaskar 1979) and I would argue that in this research, the encounters act as enabling factors which lead to a transformed social structure in the marine workplaces. This line of thinking is supported by research into participation in work activities and how this includes other workers and observing or listening, all of which have been consistently reported as key sources for workers to learn (Billet 2001). In addition, Eraut (2004) found that the learning that occurred in the workplace by early or mid-career workers was constrained or enabled by two factors: "(1) the organization and allocation of work and (2) relationships and the social climate of the workplace" (p.270). The factors mentioned here are also applicable to this doctoral research

even though the focus is on high level skills and senior managers and scientists. A similar concept appears in the Biodiversity HCDS when discussing skills and organisational structure: "For example, an organisation may have very capable high skills leaders, but if they lack support from a capable workforce, they will struggle to achieve their mandates" (SANBI/Lewis Foundation 2010, p.10). This also points to the fact that connections need to be made with initiatives and opportunities that address wider skills needs. Within the marine organisations that made up the cases in this research, communication was also a key aspect in the relatings. Communication and constructive feedback on performance also influence learning in organisations (Eraut 2004) and these concepts resonate with many of the relatings that were concerned with networking at conferences, co-workers or supervisors and the communication between scientists and managers.

Being passionate was also linked to the concept of *will* and an individual's personal characteristics in Chapters Five and Six. The role of human agency once again comes into play here and as already mentioned, the subjectivity of the agent (plane [d] of the four-planar social being model) can be seen in these instances. Barad's understanding of human and non-human agency is also useful when considering will and an individual's interest in furthering their skills or investing time and energy into professional development initiatives. If agential realism includes the realisation of different agential possibilities, as Barad (2003) suggested, then the theme of having the 'will' to up-skill or learn is crucial for this research into up-skilling opportunities and practices, a point that was also made by Archer in her theory of agency. In a comparable manner, Billet (2001) pointed out that human agency includes taking into account how individuals will differ in their "values about to which activities they should direct their energies" (p.211). With this in mind, we can also consider Archer's argument about equating agency with action (Archer 1995) and that the two should not be conflated when examining agency, due to the resulting lack of the key element that she termed 'personality'. The way in which she used this term is useful for this research, taking personality as "all the psychological differences which differentiate between us as individual people" (Archer 1995, p.121). She also described how any modifications of the personality "depend on the emergent human capacity to learn, reflect, weigh consequences and to self-monitor" (ibid., p.188). These aspects of agency and personality are manifested in this research through individuals describing their learning and the experiences they found to be of value for their careers in the marine sector. When looking at up-skilling and learning in,

through and for the workplace, the traits of human agency discussed here, combine in a complex manner to produce the notion of a unique, adaptable and ever-changing system, in which the marine professionals function, benefit from and contribute to, the up-skilling practices taking place.

Furthermore, a significant discourse or saying described in Chapter Five was that of how skills development or training is usually done on a person-to-person basis and it often takes the individual approaching the senior staff to go on certain courses or attend workshops. In the case of SANBI, this was referred to as the 'push' for training coming from the bottom up and this is a suitable way of explaining the situation where individual workers are driving their own learning experiences. With this in mind, it can be seen how motivation is an important aspect to consider and it is clear how this ties in with the above described concept of personality or passion, but also links to the 'doing' of training or up-skilling being an on-going activity. The other doings outlined in Chapter Five were mostly comprised of formal, easily recognised, opportunities such as diving courses, or skipper's training but also focussed on specific experiences the participants had had in the past that influenced their skills and learning. The MPA management training course was repeatedly mentioned as a worthwhile 'doing' for managers and in some cases, participants indicated that the MPA training led to managers being more motivated and passionate about their work in the marine sector.

7.3 Taking a socio-material approach to up-skilling: The role of the material and agency in the formal and informal learning opportunities and up-skilling practices

Earlier in this chapter it was mentioned that human agency incorporates multiple concepts in an interconnected system where the marine professionals in question play important roles when it comes to up-skilling practices in the sector. In this research I consider the *material* as a crucial part of this system and therefore take a socio-material approach to the findings associated with learning and agency. In her paper: 'Re-thinking the "thing": Sociomaterial approaches to understanding and researching learning in work', Fenwick (2010b) argued that by paying attention to the socio-material we can "reveal the dynamics that are actually constituting what comprises everyday life, including learning" (p.105). Furthermore, she acknowledged that work life is "fully entangled with material practice, technologies, vehicles,

architectural spaces, roads and roadblocks, nature and objects of all kinds, in ways that are often not even acknowledged in the preoccupation with understanding human activity and meaning-making" (ibid.). Thus, one can reflect on the material nature of marine research and management and how the marine world, tools, technologies, discourses and relationships influence, and are closely integrated with, the learning and up-skilling practices that take place, while not forgetting the role of agency. It is from this perspective, that I engage with the notion of the *events,* and the potential events, that are actualised by marine professionals in and around the workplace.

7.3.1 The domain of the Actual and the events that characterise up-skilling opportunities in the marine sector

In this section I draw on Chapters Five and Six, while keeping in mind the stratum of reality that critical realists term the 'actual' and how the deeper mechanisms at work might generate the events that are present, or absent in this domain. Mingers (2004) re-iterated this point by explaining how critical realism aims to "get beneath the surface to understand and explain *why* things are as they are, to hypothesise the structures and mechanisms that shape observable events" (p.100). He also clarifies how the existence of various objects of knowledge are recognised by critical realism and lists these objects of knowledge as: "material, conceptual, social and psychological" (Mingers 2004, p.100), but also said that each of these requires different research methods when coming to understand them. This mention of both the material and the social, confirms that socio-materialism has its place in this research along with the material transactions with nature, as described by Bhaskar and the Transformational Model of Social Activity.

Discourses play a key role in the constituting of the socio-material world, and contribute to the realities that individuals experience in their everyday working lives. Fenwick (2001) highlighted how texts and discourses mediate working knowledge and that when some things are named, and others are ignored, knowledge can be controlled to a certain degree. The extract below goes into more detail about workplace discourses and the power they may hold.

> Workplace discourses also control people's desires, values, and authority by casting certain objects as desirable, good, and commanding status, while others are derided or count for little. Finally, workplace discourses control identity by approving some identities, marginalizing others, and totally erasing some possibilities. Certain

> behaviors are endorsed by prevailing discourses as normal, while others are cast as problems – deviant, repulsive, or irrational. (Fenwick 2001, p.10)

Here, it can be noted that there are several links to other concepts used in this research, such as professional identity and agency, which was discussed in Chapter Six and of course the 'sayings' of practice architectures that were outlined in Chapter Five. An example of how a discourse might prioritise certain learning or up-skilling opportunities is that of university degrees and the notion that marine managers should have some conservation science knowledge or a basic background in marine biology. This suggestion may not be appropriate for all managers, in all cases, but taking a more holistic approach to learning and up-skilling is certainly a consideration that could be taken forward. I propose that the skills and knowledge required in marine conservation and management cannot be separated from the daily tasks and actions that are specific to the marine workplaces. This, I would argue, is due to the skills and knowledge being deeply embedded in the roles of these marine professionals, as well as being closely integrated with the marine environment in which they operate.

With regard to learning and the role of the material, Fenwick (2010b) took into account how context is often considered as separate from the work or learning occurring and she argued that "humans and what they take to be their 'learning' and 'social' processes do not float, distinct, in 'contexts' of work that can be conceptualized and dismissed as a wash of material 'stuff' and spaces" (p.105). Through highlighting the connections and the intertwined nature of learning, as well as the material and social processes, we can begin to understand how the mechanisms that affect up-skilling in the marine sector create or constrain certain types of learning. This also comes through in practice architectures and as explained in Chapter Three, I include the ecological 'context' of this research in the material-economic arrangements that make up the doings and that relate to the socio-material approach being discussed here. The adaptation and integration of what has been learnt, is of particular relevance when the marine professionals are faced with new policies, new projects, or changes in the ecosystems with which they work. Operation Phakisa is a good example, in that it meant many of the scientists and managers needed to adapt their work activities to fulfil various duties or requirements of this presidential initiative. This included interacting with different economic sectors (for example, the oil and gas industry) or research into new marine ecosystems, such as the proposed offshore MPAs. In Table 6.2.1 the issue of human capacity is mentioned under CapeNature and with regard to the socio-material realities of Operation Phakisa. In adapting their work activities, the managers and scientists seldom have enough time to achieve the

outcomes of the initiative, or if they do, other areas of their work will suffer. This is detrimental for the marine sector as a whole and is likely to have negative effects nationally, as well as locally.

Table 6.2.2 contains the finding of how popular the introductory MPA management training course was (under SANParks) and this opportunity provided relevant, practical skills and knowledge but was also a certified course so could align with the strategies and HR policies within the various organisations. At the time of data collection, the longer, three to six month MPA management training course was not available and in Chapter Five, ManagerÇ1 of SANParks remarked that these longer courses are invaluable for anyone involved with running or protecting MPAs. One could ask what underlying mechanisms are at work in order for this longer course not being actualised. In Section 1.2.3 of Chapter One, funding is said to be one reason. Through discussions during the contextual profiling phase of this research, it was also suggested that there were complications with accreditation and assessment criteria for the course. Mingers (2004) pointed out how generative mechanisms will often counterbalance one another, causing the presence or absence of actual events and this may be the case for the MPA management training course.

Much has been said thus far on informal or experiential learning and in Chapter Six it was concluded that learning on-the-job, whether from personal experience or from other people, was essential for marine professionals in South Africa. ‘Learning from experience’ is a concept that has been widely used in the fields of adult education and workplace learning and it has become a catch-all phrase that requires critique and careful de-construction (Eraut 2004). The concepts and processes that constitute and are associated with experiential learning have not always been given adequate attention and on the subject of mid-career learning, Eraut (2004) explained:

> When we refer to ‘an experience’ we are probably thinking about a single episode or incident, but when we talk about what we have learned from ‘experience in general’ we are probably referring to our accumulated learning from a series of episodes. (p.251)

From this point of view, it is clear that what was described earlier, with regard to the concept of ‘watershed moments’, was the case of ‘an experience’ as Eraut proposd, whereas when participants spoke of ‘hands-on’, ‘learning-by-doing’, and ‘on-the-job learning’, they usually meant experience in general. Learning in the workplace does not necessarily always generate

new knowledge, but might strengthen what is already known through the workers engaging in goal-directed activities: "whether these activities are of a routine or non-routine kind will determine whether individuals' work-related knowledge is strengthened or extended further" (Billet 2000, p.282). These observations are relevant to this research due to the dominance of the 'learning-by-doing' rhetoric and could be applicable to both the scientists and managers who took part in the semi-structured interviews. Nevertheless, it is essential to keep in mind the neutrality of the word 'learning' and as was discussed in Chapter Two, it is important to clarify what the content and purpose of the learning is (Biesta & Leary 2012), because learning that occurs through everyday activities in the workplace may not always be desirable, robust or transferable (Billet 2000). When possible, certification or programmes that incorporate recognition of prior learning may hold some answers to this issue (see Section 7.5), otherwise a more expert other in the workplace could ensure that the learning is meaningful.

Within all these aspects of learning, agency is at work, and the Transformational Model of Social Activity (TMSA) considers how social structures and human agency interact. Based on this notion, the Social Cube considers four interdependent planes that constitute social life but which are all influenced by human agency. In addition, the TMSA takes into account an agent's power to fashion a product out of the pre-existing material and with the tools available to him/her. Also, if we want to take into account the material transactions with nature (plane [a] of the Social Cube), as this research aims to do, knowing and action need to be de-coupled when researching work and learning, and there must be a move away from a strictly human-centred socio-cultural ontology (Barad 2003, Coole & Frost 2010, Fenwick 2012). In this way we can "liberate agency from its conceptual confines as a human-generated force" (Fenwick 2012, p.6) and as discussed in Chapter Three, materiality should be understood in a relational, emergent manner, where Barad's concept of agential realism helps in explaining the complex and uneven notion of materiality. These ideas surrounding workplace learning and agency also speak to critical realism's domain of the actual where events occur, or have the potential to occur. Bhaskar's conceptualisation of causality and an object's emergent powers is closely associated with this discussion on learning, agency and socio-materialism, all of which are central components of this research into up-skilling opportunities and practices. To summarise, when examining learning that occurs through the formal and informal opportunities in the marine sector, it is necessary to remember the role of

the material and its influence on the ever-present aspect of agency. Fenwick put forward the following view on learning, which is appropriate here, while discussing agency: "The question of producing knowledge and learning shifts from a representational idiom, mapping and understanding a world that is out there, to a view that the world is doing things, full of agency" (2012, p.5). As was pointed out in Chapter Three, however, human agency, while embedded and entangled in the world, is not the same as the materiality of things; hence Bhaskar and Archer both avoid a conflationist view of agency that sees humans and the material world as having the *same type* of agency (see Bhaskar 1979 and Archer 1998). This is important for understanding learning, and as noted a few times in Chapters Five and Six, 'will, motive and passion' are examples of some of the particular types of human traits that shape reflexive human agency in socio-material contexts.

7.4 Marine professionals and the domain of the Real: The mechanisms that enable and constrain learning in, through and for the workplace

As explained in Chapter Three, the most fundamental layer of reality, the 'real' encompasses both the actual and empirical and is the domain that is not always easily perceived. It is made up of enduring social and natural structures as well as generative mechanisms that we experience indirectly through their causal effect (Danermark et al. 2002, Mingers 2011). These generative mechanisms cause events and actual occurrences but operate independently of them (Bhaskar 1979). When investigating an anomaly or phenomenon in the social world, it must be acknowledged that we are working in open systems, where any number of occurrences and events can overlap and interact, while the people involved can learn and change (Danermark et al. 2002). Therefore, critical realism looks for *tendencies*, not laws (ibid.).

Retroduction is the process that is used to investigate particular social conditions under which a mechanism takes effect in the world (see Section 3.2.2 in Chapter Three). This process leads us to the deeper and vaster reality that Fletcher (2016) spoke of when saying: "Human knowledge captures only a small part of a deeper and vaster reality" (p.2). To get as close as possible to this 'deeper' reality, critical realism considers the world as theory-laden but not theory-determined and some knowledge is closer to reality than other knowledge (Fletcher 2016). Critical realists can gather this knowledge "in terms of theories, which can be more or less truth like" (Danermark et al. 2002, p.10). The relevant theories in this research include

practice theory and socio-materialism as described thus far in this chapter, along with the associated concepts of skill, workplace learning and adult education. Ultimately, the "key outcome of successful retroduction is to modify, support, or reject existing theories to provide the most accurate explanation of reality" (Fletcher 2016, p.10). As part of this process causal mechanisms are hypothesised which, if they do exist, would account for the actual events and experiences that were observed and described (Mingers 2004). In some cases a hypothesis or multiple hypotheses, might be eliminated and those that are left, are the mechanisms that are the 'most accurate'. So as Bhaskar argued, we begin with some accepted phenomenon and ask what the world must be like for this to occur; the argument is a transcendental one (see also Section 4.6.1 in Chapter Four, where this is discussed more comprehensively). The difference between a simple coincidence and necessary connections when there are patterns of events is that there must be some form of enduring entities. Bhaskar (1997) categorised these entities as physical, social or conceptual and these have powers to act in particular ways which may not always be observed. The crux of this argument "is that of a causal criterion for existence rather than a perceptual one" (Mingers 2004, p. 93) and the following sub-section hypothesises some of these causal mechanisms or entities as relating to up-skilling opportunities and practices in the marine sector of South Africa.

- **Mechanism A: The politics of social transformation, knowledge and the drive for formal certification**

The up-skilling opportunities and practices that were identified and explored in this study fell into two categories, what I term formal (organised, course-based programmes, either certified or not) and informal (opportunities that arise through everyday life, via work activities and interactions, both human and non-human) opportunities. These opportunities can be equated to the forms of learning that occur and thus we must consider the skills and knowledge that are involved and how these are validated by the organisations, in policy and in practice. In South Africa, the drive for social transformation and human capital development, over the last decade, has involved a national endeavour which places "investment in quality education …and in skills development …[as the] bedrock of the government's approach" in developing a more competitive and knowledge-based economy (The Presidency 2009, p.9). The broader education policy, as well as the country's skills development strategy, was based on the National Qualifications Framework (NQF) which was intended to replace all existing qualifications with a set of outcomes-based qualification (Allais 2012) and this system was

intended to be "a demand-led enterprise training policy …underpinned by appropriate supply side measures" (Kraak 2004b, p.126). The idea was to ensure that, with the help of the SETAs, a regulated market of provision of training would ensure that training was responsive to employers' needs (Allais 2012) and it is from this context that the need for research into up-skilling and workplace learning arose, particularly for the biodiversity sector. A brief mention was made of supply and demand issues in Chapter Five (under the topic of *Formal university degrees and employability*, Section 5.9: Ezemvelo) when it comes to marine professionals. However, in Chapter Two, the concept of the 'knowledge economy' was introduced and it is with this in mind, that learning and knowledge production is discussed below.

Fenwick (2010a) pointed out that when studying workplace learning, "the critical problem lies in mistaking learning as a single object when in fact it is enacted as multiple objects, as very different things in different logics of study and practice" (p.80). Here, she was referring to how the production of new knowledge is not a straightforward, linear process and all too often organisations and national policies will neatly 'package' knowledge into easily recognisable forms that are not entirely useful in real-world situations. For marine scientists and managers, in particular, this knowledge is anything but neat and this research endeavours to delve into the 'messiness' of it all. I have borrowed this idea of learning as 'messy' from Fenwick (2010a) as she followed on from her statement above, by saying:

> At the very least, particularly in the contested arena of work as a site of economic conflict and production, learning needs to be appreciated as a messy object, existing in different states, or perhaps a series of different objects that are patched together through some manufactured linkages. (p.80)

These linkages might be related to the drive for certification in the marine and coastal organisations in this research. However, the formal university degrees, short courses or certified training programmes can act as a route to empowerment and access to the biodiversity sector in South Africa. This leads to transformative action where the tools include education, training and the subsequent certification. The WIO-COMPAS programme recognised the need for certification when developing the programme and the following excerpt explains further.

> The programme was conceived as a response to the pressing need to protect the region's valuable marine assets by ensuring those entrusted with the conservation and management of those assets have the requisite skills to do so. The approach of one-off trainings to try to attain this goal had long proven insufficient as a strategy. Hence the

> turn to a model of certification – a model in which individuals participate in a rigorous process of professional assessments to prove they have the skills and can meet accepted standards in a range of necessary competence areas. (Sisitka et al. 2013)

This summary points to the challenges surrounding once-off training events and can be related to the research into short courses by Walters and Daniels (2009), who found that in South Africa, the long-term human capital requirements in organisations are not adequately met by providing short-courses, a finding also reported in the Environmental Sector Skills Plan (DEA 2010). Despite this, short-courses were generally viewed as valuable and in a positive light in this research, and in the DEA (2010) study, were noted to fill an important, if insufficient role in HCD. Both scientists and managers mentioned these formal opportunities and it could be argued that due to the nature of the marine sector and the specialised knowledge that is required, there is a place for such courses and programmes in the up-skilling strategies of the marine and coastal organisations in South Africa. Certification may not ultimately be the key to success for marine professionals, but I propose that it can (and does) act as a stepping stone on the pathway towards strengthening the field and building conservation competence in the country.

When considering the more informal learning that occurs in marine organisations, it should be noted that it may not always be transparent or easy to quantify; something that Livingstone and Sawchuk (2004) referred to as 'hidden knowledge'. Furthermore, with their work on apprenticeships, Lave and Wenger (1991) made the point that in work situations there may be very little *observable* teaching, yet large quantities of learning occurring. As mentioned earlier, there are also factors that constrain and enable learning in the workplace and when researching these factors, the importance of the 'whole performance' should not be overlooked (see Eraut 2004). Formal, certified learning is not so difficult to quantify and it is therefore not surprising that it is dominant in the discourses of the participants, national policy and the organisations' skills development strategies.

If the politics of social transformation is an intervening condition in the phenomenon of up-skilling and learning in the marine sector of South Africa, we also need to understand how this mechanism can manifest itself differently in the domain of the empirical. Archer (2010) and Bhaskar (1979) both point out the necessity of revealing any other historical generative mechanisms that produce a particular ideological structure. In South Africa, one such

mechanism could be the transformation agenda and in this research, it can be clearly seen how it plays a role in shaping the structures in the field of skills development and training in the country. Emerging out of a long history of exclusion and Bantu Education, the education and training strategies that were implemented post-apartheid have not sufficiently addressed the massive race, gender and class inequalities, especially at the senior levels of organisations (Jansen 2004, Ramphele 2008, Badat & Sayed 2014) – both within the government, the conservation agencies and smaller NGOs. The complexity of the historical legacy left by the apartheid regime makes for a challenging space when planning and implementing human capacity development strategies in the biodiversity sector. The marine and coastal organisations that formed the case studies for this research are no exception. At the levels of the empirical and actual, there is evidence to support this notion of the strong national vision of social transformation being a causal mechanism that underpins the focus on formal opportunities and certification to prove knowledge is meaningful in marine workplaces.

A note on the importance of a PhD and the learning continuum

The findings of this research pointed to how a formal degree is often seen as a starting point for marine professionals and doctoral degrees are of particular importance for the scientists. In South Africa, it is commonly accepted that doing a PhD means proving you can work independently as a researcher and in the case of marine science, this includes being thorough when considering all possible variables, as well as thinking critically about one's subject matter. In many cases, there may also be assumptions associated with completing a doctoral degree such as a capability to share the knowledge learned, or supervise others in the same field. It could be said that a PhD 'teaches' you to think in a certain way and solve problems along the way. Therefore, I suggest that it may not necessarily be so important *what* the specific subject of the thesis is, but rather *how* the candidate thinks and solves problems throughout the PhD. This broaches the idea of informal learning occurring within a formal context and linked to this idea is the following explanation put forward by Eraut (2004):

> I prefer to define informal learning as learning that comes closer to the informal end than the formal end of a continuum. Characteristics of the informal end of the continuum of formality include implicit, unintended, opportunistic and unstructured learning and the absence of a teacher. In the middle come activities like mentoring, while coaching is rather more formal in most settings. (p.250)

The idea of a learning continuum also resolves the persistent and tenuous binary of formal/informal, which is something that Jubas and Butterwick (2009) interrogated. They

suggested that binaries such as this one, or others (female/male, learning/work and hard/soft), remain strong cultural constructions with material impacts and they argued that by "moving from an either/or to a both/and understanding of them, we offer a different way of talking about how they can be observed and experienced" (Jubas & Butterwick 2009, p.30). This way of conceptualising formal and informal learning is extremely useful and hints at the associated consequences that may arise in researching workplace or lifelong learning. Colley et al. (2003) also referred to formality and informality in learning as being a relational continuum and transitions between the different forms of learning have been widely studied (see Ramsarap 2017). Thus, the concept of a 'continuum of learning' may be a worthwhile approach for any future research into up-skilling in the marine or biodiversity sector, especially in South Africa.

With this renewed perspective of formal and informal learning, the tacit skills and knowledge that are acquired during the process of completing a PhD can be considered as essential for the marine scientists in this study. Furthermore, when engaging in activities with clear work-based goals, learning is a probable by-product (Eraut 2004) and forming relationships with other people and material 'things' could also lead to such learning. The activities and relatings described here are rarely regarded as learning activities due to them being a normal part of working life. This research into up-skilling sought to gain a better understanding of the learning described here, through careful analysis of the practices and agency in the organisations. I propose that learning from others was an integral part of the learning-by-doing (or on-the-job learning) that was described by many of the marine professionals in this study.

- **Mechanism B: Individual disposition and passion or will**

The importance of an individual's personality was discussed earlier in this chapter and clearly humans differ in psychological traits, beliefs and values. These characteristics will affect their actions and decisions, for example, those around up-skilling opportunities, as well as their everyday practices in and around the workplace. It is easy to imagine that if an individual is passionate about the marine and coastal environment their motivation levels when working in, or for, these ecosystems will be higher. Furthermore, they will have the *will* to learn, pursue up-skilling opportunities and adopt practices they deem to be useful in their careers. This agency was apparent in the findings of this research and links to the concept of context

and work being intricately intertwined. This, in turn, relates to the socio-material realities that make up the third generative mechanism described below, but cannot be amalgamated with it due to the focus here being on an individual's passion for the context in which they work.

The role of agency in relation to learning and an individual's actions has been discussed at length (see Section 7.2.1) but it should be re-iterated that when investigating the up-skilling opportunities and practices, the interests and passions of the marine professionals will partly determine what learning they find most valuable and worthwhile. An important factor to consider at this point is that of professional identity and how agency shapes and re-shapes an individual's identity in the workplace over time. Billet et al. (2004) and Hodkinson and Hodkinson (2004) talked about individuals maintaining a sense of self and identity in their working lives and how they are able to, and need to, exercise independence from social suggestion i.e. be able to exercise their agency in making decisions about their own professional learning trajectories. To withstand any threats to their sense of self, which include their identities and their subjectivities, individuals need to make their intentions clear and be selective when it comes to their interactions with the social world (Billet & Pavlova 2005). These threats have "societal and cultural geneses" (ibid., p.4), as do the practices that occur in modern day workplaces and when individuals engage in work they are not immune to being influenced by these practices. Having said this, individual learning and agency is always also socio-culturally shaped as shown by the four-planar social being. Individual agency is, however, not determined by socio-cultural conditions, hence the importance of foregrounding 'will', 'passion', and 'motive' in education and learning trajectories.

The discourse of 'having will' was noted in a number of places throughout this research and although it may not have been a factor for all the participants, it stood out as a salient aspect of a what makes an effective, influential marine professional, who is keen to learn, 'up-skill' and share their knowledge with others. Eraut (2004) pointed out that learning at work occurs when individuals are "proactive in seeking learning opportunities" (p.269) which requires confidence that can be gained when challenges in the workplace are successfully overcome. This idea is supported by the evaluation results from the WIO-COMPAS programme where feedback from the MPA professionals included comments on how the participants have "significantly changed their approach to MPA management as evidenced by their greater confidence in tackling management issues; encouraging stakeholder collaboration and

community-based management; assessing their staff performance; and better handling of park visitors" (Sisitka et al. 2013, p.27). Overcoming issues or challenges in the workplace should be recognised as valuable opportunities for learning and the support received at these times will encourage and enable the individuals to become marine professionals who are capable, confident and will instil passion for the marine environment in others, in the sector.

An example of a passionate individual in the marine sector is ScientistÄ1 from SAIAB, who commented: "I love working in estuaries. If I could turn the clock back I would do exactly the same again… I've enjoyed every day, every minute of my career and [have] no regrets" (Chapter Six, Section 6.3.3). ScientistÄ1 also talked about the importance of passionate people in marine professions and said they can make a big difference in an organisation or for marine conservation on the whole. In the case of WWF-SA, ManagerH1 mentioned how he takes motivation from the managers that work under him and "their inspiration and their interest in you" (see Chapter Five). This statement followed on from ManagerH1's description of a professor at the University of Cape Town who acted as a role-model and was inspirational for him. Thus, it can be said that the relationships in and around the careers of marine professionals are extremely important with regard to motivation, passion and creating the 'will' to work, and succeed, in the marine field. These relationships are often represented through the 'relatings' in Chapter Five and it was suggested that these encounters instil a sense of passion and meaningfulness in the work and workplace practices that the individual takes part in, which in turn, affect the up-skilling opportunities and practices that they will seek out.

A note on management

The management of MPAs and other coastal areas is a complex and multi-faceted task and in general, MPAs are defined by a set of rules and regulations set out by managers and scientists that control human behaviour and activities within a specific area (Pomeroy et al. 2007). However, in addition to these rules, MPAs require effective governance and well-functioning management institutions if they are to be ecologically and socially successful (Charles 2005). Managers need to be educated and supported in which management styles are most beneficial for creating a workplace climate that enables this effective governance of the MPAs, but through their research into informal learning, Eraut (2004) established that this "aspect of management capability is very rarely found in management development courses" (p.268).

Thus, managers should have adequate training in this regard, due to the fact that they play a critical role in the learning of others, as well as the day-to-day running and governance of MPAs.

- **Mechanism C: Socio-material realities and realistic expectations**

Taking into account the socio-material means recognising how human and non-human interactions shape marine science and management as well as the learning that takes place in the sector. When searching for the deeper causal mechanisms that are associated with the socio-material realities surrounding learning by marine professionals, we need to look to the domain of the real in the way that Mingers (2004) described it: "The picture of the real is thus one of a complex interaction between dynamic, open, stratified systems, both material and non-material, where particular structures give rise to certain causal powers, tendencies, or ways of acting" (p.94). This view of the *real* illustrates the role of materiality, while not discounting the social aspects of the structures that give rise to the generative mechanisms. It also aligns with Bhaskar's four-planar social being, where material transactions with nature are acknowledged as a major part of society, relations and events. Chapter Six focused on these transactions with the material aspects of marine practices and up-skilling opportunities. The discourse around the need to be 'hands-on' in marine organisations relates to various practices and knowledge-producing events and was mentioned in relation to fisheries, managing coastal/marine projects and overutilisation issues, amongst others. In many instances, the expertise needed were highly specific and this was also demonstrated in the peer-reviewed papers that were presented in this research.

Many of the abovementioned peer-reviewed papers highlighted the context of the South African marine environment and in Chapter Six reference was made to the range of skills and knowledge that are required for the research that is reported in these published papers. The biodiversity of South Africa's extensive coastline comes with diverse challenges associated with the ecosystems and species and this is evident when considering the peer-reviewed papers listed in Section 4.4.1. One of these papers dealt with the consequences of stock exploitation of a commercially important species (the 2015 paper on *Chrysoblephus puniceus*) while another looked at initiatives to reduce prawn trawl bycatch (2008 paper from ORI). These papers, along with many others, give insights into the particular problems the scientists are dealing with; biodiversity loss, over-exploitation of fisheries and the

consequences for the human population (socially and economically) of South Africa. Griffiths et al. (2010) outlined the problem of over-exploitation of inshore resources such as coastal fish and invertebrates on the highly populated east coast. These problems translate into management concerns and also require research if informed decisions are going to be made about how to best achieve better practices for marine and coastal conservation.

The specialist biodiversity knowledge required for managing the country's MPAs is another aspect to consider when investigating the transactions with the material aspects of marine practices and up-skilling opportunities. Equipping staff with the tools that are required for these complex roles involves intricate systems of learning and the breadth of skills that are needed is extensive. The approval of 20 new MPAs in South Africa in October 2018 is a significant achievement and is a culmination of numerous research projects and decades of work with input from many institutions in the country. The acting minister of Environmental Affairs at the time commented that these new MPAs will "contribute to fisheries sustainability, advance marine ecotourism, and will help maintain resilience in ecosystems that are under stress from climate change" (SANBI 2018, https://www.sanbi.org/media/south-africa-announces-new-marine-protected-area-network/). This statement highlights the key concerns in the marine sector, all of which shape the up-skilling needs in the sector as well as affect the scope and depth of knowledge and praxis, of the marine professionals in South Africa.

Beyond the material-ecological aspects of working in the marine environment, which are central to much of this research, I suggest considering the socio-material realities of financial and human resources that influence up-skilling opportunities and practices in the marine sector of South Africa. Through the semi-structured interviews and subsequent analysis of the data, one of the common issues that emerged was that of both time and money being limited for the marine professionals. These two factors are irrefutably connected and although there is no simple solution to this issue, I would recommend a re-structuring of organisational systems and the way in which funding is allocated in the marine branches of the relevant organisations. Whether through government funding, or external budgets for specific projects, there needs to be an element of sustainability for the professionals involved and more permanent positions would mean the existing staff in marine organisations would not be under such pressure. The scientists and managers would thus be in a position firstly, to carry out their work activities to their full potential and perform more effectively, and secondly,

they could invest more time in up-skilling initiatives, training, mentoring, or networking with fellow professionals or external experts. Such up-skilling opportunities or collaborative relationships would also streamline many marine and coastal projects which could actually save time (and money). The organisations, as well as the relevant national departments, would benefit greatly in this scenario and it would lead to retention of professionals in marine organisations.

A critical concern with regard to human resources is also that of having realistic expectations when starting new marine or coastal projects, whether these are small-scale, localised projects in a province or broader initiatives that affect the whole country. As was the case with Operation Phakisa, where there was a large budget allocated for various initiatives but the human capital or skills capacity was lacking. In a number of cases, the feelings expressed by the marine professionals were those of excessive pressure to deliver on the project without a lessening of any of their other responsibilities. The knowledge and skills required for an initiative of this magnitude cannot be learnt in a matter of days or weeks, and this could reflect a flaw in the planning of such projects. The expectations that have causal powers in this situation, and others like it, either need to be adjusted through thorough assessment of the available human resources and the capacity of these individuals, or met by training and equipping the more junior employees in the relevant organisations to take on the tasks that are required in the project. The DEA (2010) study noted the need for more proactive approaches to HCD development in the environmental sector.

The structures mentioned here are relatively enduring, although not permanent features of the world and it should be kept in mind how agency is shaped by such structures, while still influencing the mechanisms in the deeper layers of reality (Fletcher 2016). In order to fully understand the learning associated with the up-skilling opportunities and practices in the marine sector, the goal must be to explain and highlight the significant structures and mechanisms, which is what I have endeavoured to do in the preceding sections that took a retroductive approach to dealing with the domain of the real.

- **Mechanism D: Relationality and the importance of connectivity between organisations and individuals**

The nine case studies in this research were made up of research institutes and organisations that had a shared, critical concern – marine and coastal conservation. Challenges such as managing MPAs, the decline of commercially important fisheries, lack of financial and human resources, or working with new/changing legislation are all part of the context of practice for these organisations and form a complex web of factors that result in relationality being essential. Bhaskar (2010) used the term 'matters of mutual concern' as seen in the excerpt below and the link to up-skilling can be seen when he mentioned critical reflection and self-development.

> Further reflection on this logic of axial rationality at work in our basic material practices of interaction with each other and the world shows that there is always a possibility within any community, say, the members of a discipline or profession, for sustained critical reflection and self-development, and hence, however far it may be removed from something which appears currently feasible, for arriving at an agreement in principle with another community (e.g. discipline or profession) about matters of mutual concern. (Bhaskar 2010, p.14-15)

Although 'arriving at an agreement *in principle*' is important, I would go further and say that marine professionals often have to reach the point of agreeing on *practicalities*, as well as the underlying principles. In this way, they rely on networks and connections between the various organisations and national departments. These networks may be in the form of an organised meeting such as the annual MPA Forums, or the various conferences which were mentioned by participants as being valuable opportunities for sharing knowledge and research interests, or requirements. The marine professionals, therefore, need the capability for relational engagement for up-skilling purposes and through interacting at the conferences and MPA Forums, they form relationships that are crucial for their careers in the marine sector. Within this relational engagement, they can deal with the complexity of the field and solve problems in an efficient and effective way.

The interconnections between the cases can be seen in the case of CapeNature, where the manager is renowned for being the type of manager who will contact the scientists at SAIAB when he encounters a problem and needs advice. Relationships such as this one require communication and a useful way for scientists or researchers to keep in-touch with the current issues and concerns in MPA management or marine and coastal conservation, is to interact with the managers who deal directly with these issues on a daily basis. In addition,

both the managers and scientists need to communicate effectively with the policy-makers and law-enforcers around concerns like poaching or over-harvesting of certain species. This can be done through the national departments; in South Africa this would be the Department of Environmental Affairs, or the Department of Agriculture, Forestry and Fisheries. With regard to up-skilling opportunities, these networks play a vital role through the entire system and an initiative such as WIO-COMPAS recognises this by including networking in the programme. In a paper looking at innovations in capacity building for MPAs, Squillante et al. (2010) mentioned partnerships and the importance of buy-in from the relevant organisations and stakeholders at regional and national levels.

Relationality is central to the Social Cube and the TMSA, as the TMSA is a relational philosophy and the Social Cube serves as a model for structure and agency, where all planes are related. Of particular interest when discussing the inter-connectedness of organisations are the planes of social relations (plane [c]) and inter-intrasubjective [personal] relations (plane [b]). Across the nine cases, the marine professionals described relationships with others that enabled learning, inspired interest in marine, coastal or estuarine issues and furthered their careers. In addition, they operated in certain institutional systems and made use of the available opportunities to succeed as professionals. The TMSA claims that through engaging with structures, institutions and forms, as well as through relationships with others, individuals will either reproduce or transform society and in the context of up-skilling in the marine sector, this relationality has been uncovered as powerful and causally efficacious.

7.5 Summative perspectives and recommendations

In Chapter One, I state the overarching goal of this research as: to understand if and how learning takes place through up-skilling opportunities and professional practices, in the marine sector of South Africa. With a focus on learning and by discussing a number of other important concepts, this study has attempted to develop a well-rounded understanding of the topic and the deeper structures and mechanisms that have power and causal efficacy when it comes to up-skilling opportunities and professional practices. The experiences, events and mechanisms that have been explored in this chapter, have provided insights into the forms of learning that occur in the marine sector, as well as the complex relationships between formal and informal learning. The first recommendation from this research relates to this interplay between formal and informal learning and the key factors that influence the learning

opportunities are discussed. The following sub-sections go on to describe further recommendations that I propose from this study into up-skilling.

7.5.1 The essential combination(s) of formal and informal learning

The professional practices that occur in the everyday working lives of the marine professionals have been outlined in this research and have been shown to be an integral part of the learning process. In some cases, the experiences and material practices appear more meaningful than the formal up-skilling opportunities that are available in the sector. However, the formal opportunities certainly have a vital place and the marine scientists and managers rely on the knowledge gained through these opportunities as it forms a base on which they can develop relevant practices and further learning.

Moreover, there is a need for *more* accredited opportunities, specifically in the marine sector of South Africa, especially in the light of new challenges opening up such as those emerging around Operation Phakisa. This absence of accredited opportunities came through in many of the cases in this research and the emphasis on certification rather than recognising prior experience, has implications for how individuals access the sector. Ramsarup (2017) explored the notion of parallel or secondary pathways into the environmental sector and found that entry into the sector was not guaranteed by a qualification, such as a Bachelor of Science or national diploma. This, despite numerous reports that South Africa does not have adequate scientific skills (SANBI /Lewis Foundation 2010, HSRC 2009, Greenmatter 2012) and in particular, the scarce skills that were discussed in Chapter One of this thesis. The misalignment between skills requirements in the sector, education systems and training programmes needs to be addressed at all levels from school to higher education institutions and workplaces where lifelong learning occurs (the Biodiversity HCDS refers to this as the 'Human Capital Development pipeline'. see: SANBI /Lewis Foundation 2010, p.11). By recognising that these issues percolate through the entire system, it might ensure more relevant up-skilling opportunities for professionals in the biodiversity/environmental sector. The learning pathways interact with skills in such a way that formal opportunities may not be the only route of accessing and progressing in one's career, but it should be noted that field of environmental education and the training systems are situated within the "wider transitioning process oriented towards social-ecological sustainability, social justice and greener economies" (Ramsarup 2017, p.iii).

An example of a possible secondary pathway into the marine sector of South Africa is the use of a functional model of Recognition of Prior Learning (RPL). The country could strive to establish a more widely accepted system of RPL and a programme like WIO-COMPAS offers valuable lessons in this regard:

> RPL models need to grow organically within specific contexts, and not be imposed in line with a particular generic theoretical approach. Another lesson may be the recognition of the critical importance of the fundamental assessment principles as demonstrated by the rigor and the richness of this model. (Sisitka et al. 2016, p.2)

The authors went on to comment on how formal education communities in South Africa and elsewhere, battle to understand and accept the value of experiential learning and knowledge generated in the workplace, and this is supported by the fact that RPL does not feature in the Environmental Sector Skills Plan, nor the HCDS for the biodiversity sector. This may also be because there have been difficulties in implementing RPL policy and practice in South Africa to date (South African Qualification Authority 2013). However, RPL is mentioned in the DHET's White Paper for Post-School Education and Training and this document states that systems in place "should be simplified, supported and strengthened" (DHET 2013, p.73). The South African Qualification Authority (SAQA) research division have been working on research to inform such systems, which include long-term SAQA-Rhodes University partnership research looking at learning pathways and articulation in emerging sectors, as well as SAQA-Durban University of Technology partnership research (Bolton et al. 2017). These complexities surrounding alternative pathways into the biodiversity sector have implications for the individual and may constrain the potential learning opportunities that could otherwise result in transformative praxis for the sector, as also argued by Ramsarup (2017).

7.5.2 Steps towards social transformation

The reasons for this research into up-skilling opportunities and practices stem from South Africa's aspirations of a transformed and socially just society. Thus the creation of the Human Capital Development Strategy for the biodiversity sector and as is stated in the executive summary, this document "provides a framework through which organisations can strengthen their human capacity to deliver on their biodiversity mandates and meet their transformation objectives" (SANBI/Lewis Foundation 2010, p.iv). In Section 5.3, under the sub-heading of the sayings and doings at SAIAB, the issues surrounding transformation and

employment equity are discussed in relation to the marine sector. Although not unique to marine and coastal organisations, these issues need further research and realistic implementation strategies if South Africa hopes to achieve a transformed society. Booysen (2007) considered the retention of blacks in management positions in South Africa and defines organisational transformation as a systematic change in employment equity practices, while arguing that legislative compliance is only the first step in employment equity. She maintained that organisational cultural change is necessary for true diversity to be actualised. I would suggest that this argument applies to both race *and* gender and without the change that Booysen talks of, the inequalities will persist in the marine sector as well as the biodiversity sector. This notion of a need for changes in the organisational culture is supported in this research by the discussions about employment equity that ManagerÇ1, from SANParks, and I had (see Section 5.8.2.2, under the subject 'Skills and equity'). He comments that in general, SANParks is meeting the equity requirements in terms of race and gender, but within the conservation department specifically, that is not the case. This also applies to the different career levels and this challenge requires systematic changes for the organisation at multiple levels, as suggested by Booysen (2007).

In addition to organisational transformation, it should be noted that a just society is made up of individuals who are passionate about bringing about change. The discussions focusing on agency and an individual's disposition (see Mechanism B in Section 7.4) support this notion and the significance of having passionate individuals in the biodiversity sector should not be overlooked. I suggest that these qualities of the professionals in the biodiversity sector need to be recognised and appreciated more. This study has shown that the agency of those who have a keen interest in their roles in the sector, and who are willing to go the extra mile, can lead to better praxis in the marine biodiversity sector in South Africa, which ultimately benefits both the environment and society.

7.5.3 The need for opportunities that foster relationships within and between organisations

To arrive at improved practices in the biodiversity sector, I also advocate for a greater emphasis on the relationality and networks within and around the workplaces, as well as adopting practices that promote collaboration and communication between professionals. This is based on the fact that relationality was found to be a generative mechanism that had causal powers which influenced the learning and skills development of the marine

professionals as well as the interactions between the organisations. The theme of communication and the importance of forming good relationships came through in the majority of the cases, as a vital aspect of the participants' up-skilling and professional practices and this serves as evidence for the recommendation being made here. There thus needs to be a strengthening of people's capabilities for cross-institutional networking and if organisations focus more closely on this capability, they will come closer to the goals of best practices and relevant human capital development strategies.

Platforms such as the MPA Forum serve as valuable opportunities and this was re-iterated by many of the marine professionals (see Section 5.6.2, under the subject: *DEA, leadership and forming relationships,* or Section 5.7.1; *Available opportunities,* or Section 5.8.1.1; *Managers and the MPA Forum,* as well as further discussion in Chapter Six). In addition, attending conferences, was shown to be a worthwhile way in which networking can happen and programme leaders, as well as conservation managers, should be financially and institutionally supported to attend conferences. By attending events such as the Southern African Marine Science Symposium, or the MPA Forum, scientists and managers can establish better channels of communication, as the findings of this study suggest.

7.5.4 Methodological approaches that lead to deeper understandings

The sayings, doings and relatings of practice architectures, as well as the socio-material realities outlined in this study show that learning, and the *recognition* of this learning, is constituted in the form of a complex web of interactions and connections between things, people, and practices in the marine sector of South Africa. Using the Transformational Model of Social Activity and the Social Cube, these interactions have been explained in way that aligns with the underlabouring philosophy. Through underlabouring the research with critical realism I have been able to show how the domains of the real, the actual and the empirical can be explored using a socio-material analysis and the tools of practice theory. I believe that with this methodological approach, this research has achieved the goal of understanding if and how learning takes place through up-skilling opportunities and professional practices, in the marine sector of South Africa.

7.6 Identifying limitations of the study

This research primarily involved nine organisations and these ranged from a larger government department that co-ordinates and managers most of the marine and coastal conservation efforts in the country (DEA – Oceans and Coasts), to national or provincial conservation agencies, smaller NGOs that run projects along the coast, and research institutes that specialise in marine, estuarine and coastal science. These organisations formed the case studies in which in-depth investigations took place and in each case, between one and four marine professionals were interviewed. The 'classification' of these participants and organisations was not always straightforward but using my background knowledge of the marine and coastal sector, I made informed decisions on the nomenclature used for the participants and organisations/institutes involved.

In the research institutes, the participants were all research scientists, with the exceptions of the directors who were not really involved in their own research projects, but were overseeing the projects and staff in the institutions. However, due to them having scientific training, and backgrounds in research, I referred to them as scientists to minimise confusion in the discussion of the findings. In many of the conservation agencies and NGOs, the managers or programme leaders also had scientific backgrounds but due to the roles they were in, within the organisations, I considered them managers, with the exception of ScientistÇ1 from SANParks, and ScientistW1 from Ezemvelo, as their roles were still strongly aligned with research in these conservation agencies.

Another obvious limitation in this study was the problem of acquiring formal documents from some of the organisations and for many of the cases I could not source the appropriate documents pertaining to training or skills development. This meant I could not consider the possible discontinuities between findings from the documents and what was being actualised in the workplace. The methods for sourcing documents included searching the relevant websites, as well as e-mailing the relevant people, and using personal contacts, but these did not prove fruitful for all the organisations involved.

Other than this challenge of sourcing the relevant documents, there were times when the interviews became more about access to the marine sector and marine skills development programmes, than skills development and learning at the higher levels of the organisations.

The importance of internship programmes such as Groen Sebenza, run by SANBI, came through when discussing experience in the marine field and in addition, many of the degrees or diplomas that were mentioned were in relation to school-leavers looking to enter the biodiversity sector. The availability of these degrees, diplomas, or programmes underpins many of the critical issues faced by younger or less experienced individuals. Here, there are also implications for how transformed the biodiversity sector will be in the upcoming years and the Biodiversity Human Capital Development Strategy, as well as the Environmental Sector Skills Plan, both look at these issues and the underlying causes such as the poor quality of schooling and challenges in the Higher Education system of South Africa.

Due to experiential learning being of an informal nature, it often goes unrecognised by working people themselves, even though most of this learning is of high quality (Livingstone & Sawchuk 2004). One must also consider the situation that Eraut (2004) describes as "the cumulative aggregation in memory of the perceptions of many previous episodes" (p.253). This notion includes the assumptions that are made about people, situations and organisations and how these are often difficult to recall or describe. Such tacit knowledge in the working lives of professionals is not easily accessible and when investigating practices in the workplace, heuristic processes or 'tricks of the trade' (Billet 2000) may be overlooked as insignificant, when in reality they contribute to the up-skilling of individuals. In workplaces and in our everyday lives, Eraut (2004) pointed out that: "We instinctively 'know' that a particular action is appropriate. However, because the aggregation process has not been under our conscious control, there is a danger that our selection and interpretation of information from these episodes was biased" (p.253). Despite such biases being unavoidable, it is critical that they are noted and kept in mind when reflecting on the findings and deeper structures and mechanisms that are present when exploring up-skilling opportunities and practices. In conclusion, it is therefore worth acknowledging that much of what came through in the semi-structured interviews was only what could be recalled by the marine professionals and it is likely that many up-skilling practices were not mentioned or highlighted as important learning experiences.

7.7 Possibilities for future research

As pointed out above, the formal HCD documents for certain organisations were not easily accessible (or did not exist) and in some cases, the information was outdated. Thus, one

possibility for future research would be to investigate the support systems that are in place (at a sectoral level) for assisting biodiversity organisations in developing the human capital development documentation that can guide their up-skilling practices. By taking into account the generative mechanisms listed in Section 7.4, policy-makers at a national level, could adjust their recommendations to organisations, when it comes to HCD initiatives within organisations. In this way, better decisions can be made regarding what opportunities, practices and knowledge-producing activities are most worthwhile for professionals in the biodiversity sector.

The issues surrounding transformation in South Africa's biodiversity sector also require more attention and as described in Chapter Five, and earlier in this chapter, there are complex socio-political structures and mechanisms at work when it comes to this topic. This research offers insights into the effects of the *national vision of social transformation* on human capacity development and how it actualises in many marine organisations as a focus on formal opportunities and certification (see Mechanism A, in Section 7.4). However, further research into transformation, in terms of race, gender and class, would build on the findings of this research, which have shown that skills development in the marine sector is multi-modal with up-skilling taking the form of mentoring opportunities; secondary pathways, such as systems of recognition of prior learning; opportunities for learning from others; and formal training opportunities. Within this complex context of South Africa and its ambition for equity and social transformation, up-skilling plays a vital role and this research highlights the importance of transformation in the biodiversity sector of South Africa.

Another possibility for expanding on this research would be to study the topic of mobility in the sector and investigate the way in which formal qualifications are structured in relation to the jobs that are available in the biodiversity sector. This stems from the accounts given in a number of cases about how positions in the sector require project management skills and these holistic skills are becoming more important (see Table 5.1.2 in Chapter Five; Chapter One, Section 1.2.1, Chapter Two, Section 2.2; and Chapter Six, Section 6.2.2). There appears to be a move away from the more technical, knowledge-based skills for many jobs in the biodiversity sector and this phenomenon could be studied in the contexts of universities and other higher education institutes. This might also involve studying the larger, national structures in place such as the NQF (National Qualifications Framework) and SAQA (the South African Qualifications Authority). Along with the Sector Education and Training

Authorities, these systems have an influence on what training occurs and which formal qualifications are supported in the relevant sectors (Kraak 2004b, Allais 2012).

7.8 Contributions to the field

There a number of ways in which this research contributes to the field of environmental education and workplace learning, with a focus on the marine sector of South Africa. These contributions for this particular field are linked to the recommendations made in Section 7.5, as well as the discussions around the mechanisms and key concepts presented in this chapter. This study revealed some of the unique features of the up-skilling environment in the marine sector, and explored the knowledge required by the professionals to successfully carry out their work in the marine and coastal organisations that formed the case studies of this research. Two key contributions are outlined below and finally the claim to new knowledge is put forward as a closing statement.

1. **Enabling learning for the workplace involves a complex interplay between formal and informal opportunities and practices.**

The research goals of this study were set out in Chapter One, and included gaining an understanding of the relationship between formal up-skilling opportunities and informal learning. By considering informal opportunities and learning in the marine workplaces, this research went beyond merely investigating the formal, course-based or certified opportunities where university degrees or certificates define the competence of an individual. The 2010 Environmental Sector Skills Plan (ESSP) mentions the degree offered by the Cape Peninsula University of Technology, namely the MTech in Oceanography, but also highlights how "international programmes appear to have a stronger work integrated learning orientation than current South African programmes" (DEA 2010, p.33). This comparison can be related to best practices in environmental management/sustainable development and gives an indication of the challenges faced by all branches of the environmental sector in terms of the required training and skills development. The findings from this research into up-skilling opportunities and practices in the marine sector of South Africa, reinforces this idea of work integrated learning being of paramount importance, while not dis-crediting the role of formal opportunities or certification (see Mechanism A in Section 7.4).

The work integrated learning mentioned above, is a type of informal learning and this research has brought to light a number of ways in which informal learning occurs for the marine professionals that participated in this study. These forms of learning have proven to be especially relevant when looking at high level skills in an ecological setting; i.e. professionals working in marine and coastal environments. Here, the metaphor that Livingstone and Sawchuck (2004) used is appropriate, that is: how "adult learning is like an iceberg, with most of it submerged informal learning" (p.11). That which is easily seen, represents the formal, course-based opportunities but the bulk of the learning occurs 'beneath the surface', through informal opportunities and everyday practices in and around the workplaces. By highlighting how marine managers and scientists make use of these opportunities, this research has demonstrated the value of learning through experience and in the future, human capital development policies or strategies might incorporate and acknowledge this form of learning. In addition, this research found that the relationality between individuals, as well as organisations, was pivotal for the professionals and the learning that occurred in, through and for the marine and coastal workplaces. In relation to university graduates, the Biodiversity HCDS refers to the importance of networks and also states that staff in leadership positions need "good reputations as researchers, good teaching skills, up-to-date knowledge, a passion for their field and good networks" (SANBI /Lewis Foundation 2010, p.45). The aspects of passion, up-to-date knowledge and networks are very much the same for professionals in the marine sector. By recognising and appreciating the significance of passionate individuals and relationality in the biodiversity sector, this research has shown how the appropriate platforms for interaction and communication can benefit the learning processes that occur through networking, as well as the motivation of the marine professionals.

2. **Including a socio-material analysis offers a more nuanced view of the complex relational objects such as up-skilling processes and opportunities.**

The focus on the material aspects in this research has contributed to a fuller understanding of the intricacies and specific challenges in the marine sector. The marine, coastal and estuarine ecosystems shape the up-skilling opportunities and practices by creating particular skills needs, as well as specialised knowledge requirements, for this context. Expertise is also needed in a diverse range of topics relating to the marine environments and this study has shown that professionals will often drive their own capacity development, if they have a keen interest in a certain area of

research. Thus, there is both scope and depth in the knowledge and skills that are required and the associated learning comes from multi-facetted up-skilling opportunities and practices. In addition to the ecological aspects of the marine workplaces in question, materiality includes the resources available to the marine professionals, such as time and funding. These factors also hold power in terms of which opportunities and practices are taken up or most valuable. With a socio-material analysis that involves practice theory and critical realist tools, it was possible to explore the generative mechanisms such as the transformation imperatives that were found at all levels of the four-planar social being.

Taking a socio-material approach also involved tracing the background of, and interplay between, a number of philosophies or models, such as new materialism, socio-materialism, the material-economic dimension of practice theory, and the four-planar social being model that constitutes Bhaskar's Social Cube. These theories define or explain the role of the material in slightly different ways, but with careful clarification on these differences, as well as any similarities, they ultimately worked together to produce an in-depth and critical discussion of the marine materiality in this research. This offers a methodological contribution to skills system research in South Africa in that, to date, no studies into environmental education skills development have included analysis of the socio-material as outlined via practice theory and Bhaskar's depth ontology and four-planar social being. In this study, this framework allowed me to: surface the complex context of up-skilling opportunities and practices, highlight the way in which agency in the up-skilling arena is related to the material, and highlight the psycho-social in complex configurations.

7.9 Conclusion

This research has considered the ways in which up-skilling opportunities and practices enable learning in, through and for workplaces in the context of the marine sector of South Africa. A better understanding of the up-skilling opportunities and practices of marine professionals contributes towards improved human capital development in the biodiversity and environmental sectors and through offering more complex insights into the forms of learning and up-skilling, as well as a distinct methodological contribution, this research has broader relevance for workplace learning research.

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Appendices

Appendix A: List of websites – the institutes/organisations that formed the nine case studies of this research and other relevant organisations

Appendix B: Permission form

Appendix C: Original questionnaire that was adapted into an interview schedule (including Table for answers

Appendix D: WIO-COMPAS Brochure – as an example of an informal document included in the data analysis phase

Appendix E: Example of Excel spreadsheet format and of coding into main theme

Appendix F: Diagrammatic representation of the development of themes and subthemes

Appendix G: Links between themes

Appendix A: List of websites

Case study 1: ORI – Oceanographic Research Institute (SAAMBR)
https://www.saambr.org.za/oceanographic-research-institute-ori-position-statement/

Case study 2: SAIAB – South African Institute for Aquatic Biodiversity
http://www.saiab.ac.za/

Case study 3: DEA – Department of Environmental Affairs: Oceans and Coasts
https://www.environment.gov.za/branches/oceans_coast

Case study 4: SANBI – South African National Biodiversity Institute
http://www.sanbi.org/

Case study 5: CapeNature – biodiversity conservation: Western Cape
http://www.capenature.co.za/

Case study 6: WWF – World Wide Fund for Nature; Marine programme: South Africa
http://www.wwf.org.za/our_work/oceans/

Case study 7: SANParks – South African National Parks: biodiversity conservation
https://www.sanparks.org/

Case study 8: Ezemvelo KZN Wildlife – biodiversity conservation: KwaZulu-Natal
http://www.kznwildlife.com/

Case study 9: WESSA – The Wildlife and Environment Society of South Africa
http://wessa.org.za

SAEON: http://www.saeon.ac.za/

SANCCOR: https://sancor.nrf.ac.za/

Appendix B: Permission form

Permission form

This is a formal request for your participation in the research project entitled:
"Exploring up-skilling opportunities and professional practices in the Marine Sector of South Africa."

PHD candidate: Caroline Bell
Contact details: Email 4carolinebell@gmail.com; Phone 046 6038390; Cell 072 5859 246
Rhodes University, Environmental Learning Research Centre

I am conducting this research as a fulltime doctoral student at Rhodes University, under the supervision of Professor Heila Lotz-Sisitka. I am in the Faculty of Education, specialising in Environmental Education. My background is in marine biology and I have had previous experience in environmental and outdoor education. The goal of my research is to understand if and how learning takes place through up-skilling opportunities and professional practices, in the marine sector of South Africa, and ultimately, I hope to inform the implementation of the Biodiversity Human Capital Development Strategy and assist the relevant Sector Education and Training Authority (CATHSSETA) in making decisions through this research.

The main research question of this study is:

- How do up-skilling opportunities and practices enable learning in, through and for the workplace, by marine professionals?

The sub-questions I will be using to explore this concept further are:

1. What up-skilling opportunities and professional practices exist in or for, marine conservation organisations and how do generative mechanisms shape the constitution and enactment of these opportunities and practices?
2. How do the individuals learn and exercise their agency within the socio-material context (the marine scientific and management context), through these up-skilling opportunities and practices?
3. How can formal up-skilling opportunities and practices interact with informal/non-formal learning and practices in the workplace?

To explore the above questions I will need to work with professionals in marine research institutes and/or conservation organisations. By professionals I mean senior managers or

scientists/researchers, or the equivalent in terms of more experienced staff members in the institute or organisation.

I will require at least one interview with the senior manager/scientist, with possible follow-up interviews to clarify original responses (with a limit on follow-up interviews to 3 per participant). These interviews will preferably be in-person, but may also be over Skype, telephonically, or through email correspondence. Certain participants may be asked to fill out a questionnaire regarding the up-skilling opportunities available in their organisation/institute. If the participant is willing, I will request a copy of their CV. In some cases, I will be conducting observations of meetings or discussion groups and would negotiate access to these events prior to them occurring.

Ethical considerations

By agreeing to be part of this study, you can be assured that:

- Your participation in the research is completely voluntary and you have the right to withdraw from the study at any stage, for any reason;
- You will remain anonymous in any form of written-up work;
- You will be given the chance to verify the data I collect from any interviews, group discussion or observations undertaken, before it is reported formally anywhere;

The full research proposal for this research was approved by the Higher Degrees Committee of the Faculty of Education at Rhodes University (September 2014). In this proposal I outline the above ethical considerations and state my intention to be aware of, and respect, any cultural differences between myself and the participants. I will endeavour to be respectful to all individuals and organisations involved and will give an honest account of the interactions I have during this research.

Consent

Having read the above information do you (the participant) agree to take part in this research? If yes, please sign below.

_____ _____

Participant's Name (printed) Organisation/Institute

_____ _____

Participant's Signature Date

Caroline Bell /2015

Name and signature of researcher (person obtaining consent) Date

PLEASE DO NOT HESITATE TO CONTACT ME WITH ANY QUESTIONS OR COMMENTS.

Appendix C: Questionnaire/interview schedule

QUESTIONNAIRE **Research into up-skilling opportunities and professional practices in the Marine Sector of South Africa** *Rhodes University, Environmental Learning Research Centre* **PHD candidate: Caroline Bell** Contact details: Email 4carolinebell@gmail.com; Phone 046 6038390; Cell 072 5859 246 **SUPERVISOR: Professor Heila Lotz-Sisitka**	
PLEASE COMPLETE YOUR DETAILS BELOW	
Name:	
Organisation name:	
Designation:	
Department:	
UP-SKILLING IN YOUR ORGANISATION	
1. Do you promote or offer any up-skilling opportunities to **senior managers/scientists** in your organisation? **YES** ☐ **NO** ☐ **If yes, please give details of these in the Answer Table on page 3**	
2.1 Do you receive or require any feedback from the senior managers and/or scientists on the up-skilling opportunities that they make use of (both internal and external)? **YES** ☐ **NO** ☐	
2.2 If yes, is the feedback: Written, verbal, presented, work-shopped, or other (please specify)?	
2.3 Are there structures in place for incorporating feedback into future decisions relating to these opportunities? If YES, please explain further.	

3.1 Would you say that there are sufficient and effective up-skilling opportunities for senior managers/scientists in the marine research and conservation sector? **YES** ☐ **NO** ☐	
3.2 If no, what more is needed?	
4. Does informal learning take place within your organisation/institute among senior managers/scientists? If YES, how would you say this occurs?	
5. When identifying or recognising an up-skilling opportunity for a **senior manager/scientist,** is it important for it to be formally accredited? **YES** ☐ **NO** ☐	
6.1 Who is the relevant SETA for marine research and/or conservation and what is their core function, as far as you know?	
6.2 Describe the interaction this SETA has with your organisation/institute.	
ANY OTHER COMMENTS OR THOUGHTS on anything mentioned above or related to the area of up-skilling and skills development or professional practice in the marine field?	

ANSWER TABLE for QUESTION 1

Opportunity/programme		Offered in-house or external?	Compulsory?	Funded by?	Offered in collaboration with?	How often?
Marine research or conservation related						
Other or general (Managerial, IT, health-related or personal management etc)						

Appendix D: WIO-COMPAS Brochure

"Thanks for your commitment to this professional certification programme – well done! It was a privilege to be amongst the first MPA PROs"

Janelle De Toufl, Programme Manager for the Cape West Coast Biosphere Reserve and Level 2 MPA PRO

Visit www.wio-compas.org to see profiles of MPA PROs, case studies and upcoming certification offerings!

TAKE ACTION!

MPA Authorities
Encourage your staff to apply
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Host certification events
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Donors
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Email: secretary@wiomsa.org Tel: +255-24-2233472 Fax: +255-24-2233952
Western Indian Ocean Marine Science Association, PO Box 3203, Zanzibar, TANZANIA

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WIO-COMPAS

Western Indian Ocean • Certification of Marine Protected Area Professionals

Certification • Professional Development • Networking
Leadership • Innovation • Ethics

Certifying Bodies

WIO MSA

Coastal Resources Center

Endorsed by

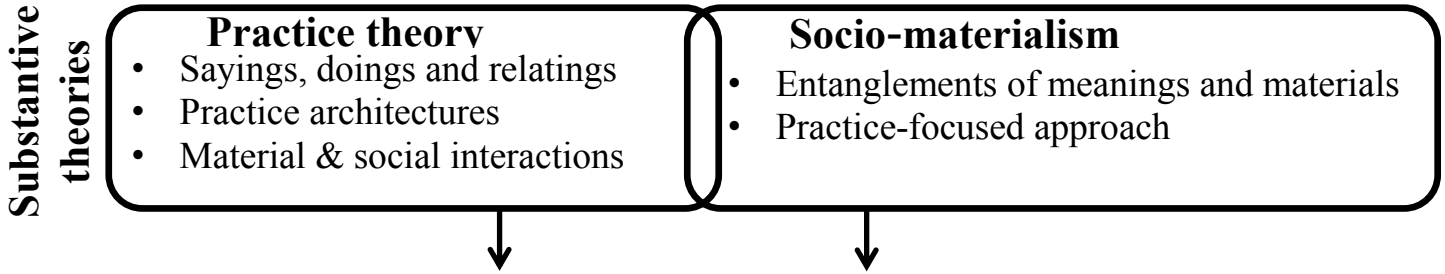
IUCN WCPA World Commission on Protected Areas

Appendix E: Example of Excel spreadsheet format and of coding into main themes

Theme:	Sayings	Doings	Relatings	Socio-material	Agency	Learning	Formal	Informal
ORGANISATION								
SANBI ***Manager(É1)***	"managers say they want to send this person, that person for this specific training" "identified on a person-to-person basis" p1	SANBI has a science career ladder, measures inputs: qualifications, years worked and outputs: papers written, citations, HCD such as students supervised.p.1		"budget is made available which is why they ask for these annual recommendations for capacity development or training of staff" p1	She describes a lot of her knowledge and skills as "very much self-taught" p6	Manager E1 learnt more in the last 7-8 years working at SANBI than in the two years of Masters because of **real world experience** she's been able to accumulate. p2		
WWF Manager*(H1)*	It's not always clear what the opportunities are, for people p4	"You identify with your manager what you want to do"". P1 ie. **One on one basis.**	WWF has a senior manager (the interviewee) and two-three managers below him. P1	Limited budget for training. P2	If you want to pursue further studies "you would need to motivate" and discuss with your manager. P3		The marine administrator was also being supported to do a business management course through UNISA. As well as person X who runs the small-scale fisheries project is being supported to do an MBA. (Partial funding). P2	**"often you actually get better experience on-the-job, and we have a lot of partners". P2. Also: *relatings***

SAIAB Scientist (S1)	During his PhD a research job came up, so he took it and changed his PhD to align with his work. P1	His honours supervisor offered him a MSc at St Lucia **(see informal)** and he says: "him moving to Pietermaritzburg was probably a watershed, because if he hadn't gone (?) there was no other staff member in the university, who had an interest in aquatic sciences really..." p3		His salary came from SANCOR funding. P1	Passion for the field: "I've done that all my life and I love working in estuaries, if I could turn the clock back I'd do exactly the same again… …But I've enjoyed every day, every minute of my career and no regrets". p2	"I've also learnt that scientists can learn from people who are on the ground, fishermen for example." P4		He had some influential supervisors during his varsity days and chose to work on fish for his Hons project. He really enjoyed it so pursued it for his Masters and PhD. p2

Appendix F: Diagrammatic representation of the development of themes and sub-themes

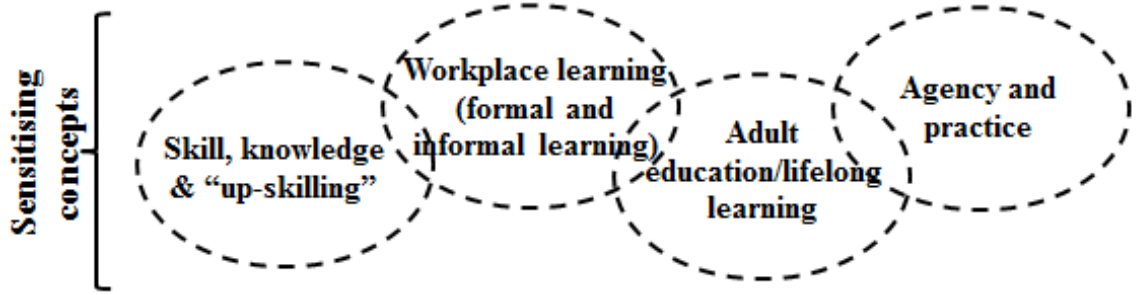


Resulting Themes: **SAYINGS**

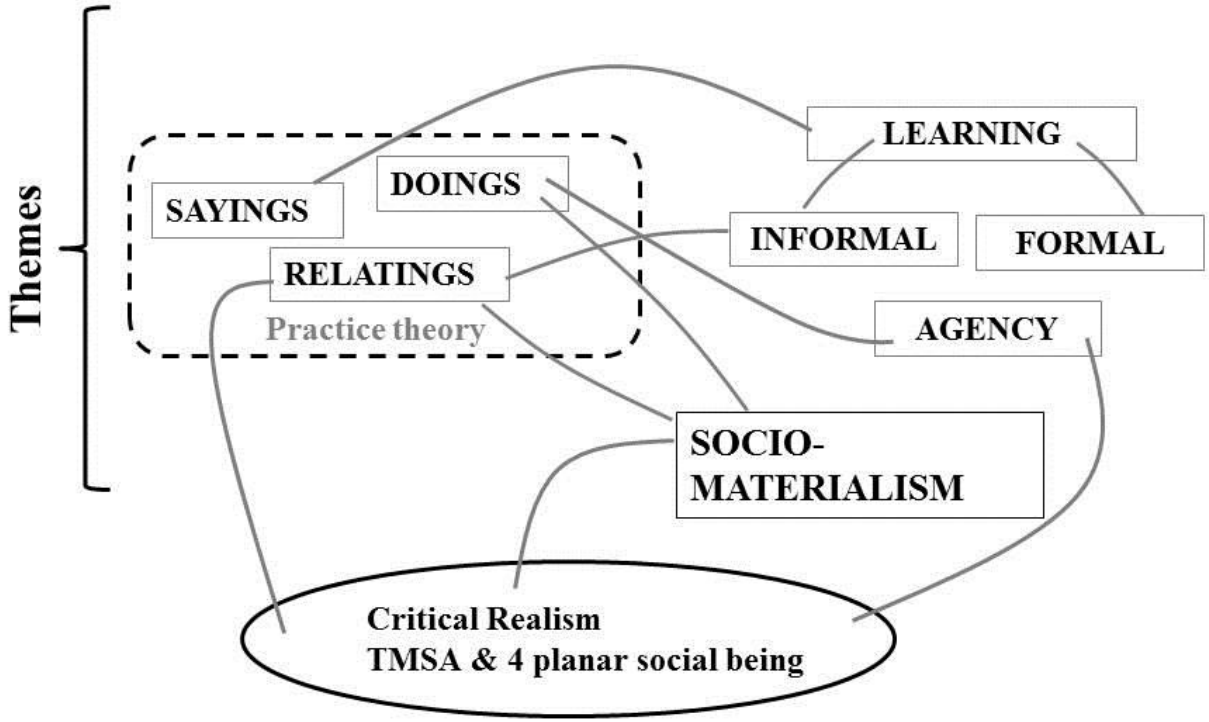
DOINGS

RELATINGS

SOCIO-MATERIAL



Resulting Themes: **AGENCY; LEARNING; FORMAL AND INFORMAL LEARNING/OPPORTUNITIES**

CR and Social Cube relate to ALL themes but especially: **AGENCY, SOCIO-MATERIAL & RELATINGS**

Appendix G: Links between themes