7 IMPERATIVES FOR SUCCESS IN RESEARCH

Ulrich D. Holzbaur | Laetus O.K. Lategan
Karin Dyason | Deseré Kokt

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SUNBONANI SCHOLAR

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PREFACE

It is a well-known fact that universities need to be leaders in research excellence. In keeping abreast with the competitive research challenges, universities need to educate the next generation of researchers. Hence, there should be an on-going effort to focus on the development and capacity building of researchers, research managers and also research administrators. This book addresses the most important skills and competencies that these parties need to master when doing and managing research. There is a specific focus on early-career researchers that need to comprehend the complexities of the research environment and plan their careers in such a manner that they are able to make a significant contribution to the scientific community and the development of society. Of course, scientific competencies for doing research are the bread and butter of research: working with literature, modelling and the paradigms of one's own field of research are necessary prerequisites.

This book concentrates on what is beyond: the competencies that one needs not only to do good research, but also to be successful as a researcher – be it within or outside the university. Understanding what research is all about is a necessary prerequisite for any researcher: This includes the knowledge about knowledge creation and also about the academic environment – a very special biotope. To succeed in the long term, it is important to plan one's own career: Based on planning, aspirations and competencies and on the ability to develop one's skills – including planning skills. Becoming an acknowledged researcher is based on two pillars: On the one hand, one must become a renowned person and on the other, the impact that one makes must become known. This impact is made in three ways: Communication and presentation, written publications and knowledge transfer.

From these objectives, seven imperatives are derived. These imperatives will inform the following discussions:

- **Know what research and the research environment is all about:**
  Understand research and knowledge creation and the academic environment.
- **Personal development and career advancement:**
  Know yourself and develop your own aims, skills and personality and a strategy for success.
- **Be a trustworthy person:**
  Behave ethically on a personal and professional level.
- **Develop your planning skills:**
  Be able to plan strategically and to manage projects effectively.
- **Communicate your results:**
  Market yourself and your research projects and results by communication and presentations.

- **Get published:**
  Develop your writing skills and plan your research to get published in the right way.
- **Go beyond ... the ivory tower:**
  Make sure that your results make an impact on the real world by knowledge transfer.

This book is presented with the following in mind:

- The focus is on all levels of researchers, research administrators and managers.
- Special emphasis is placed on early-career researchers and on mentoring, which could be valuable for mid-career and established researchers.
- It serves as a guide to train researchers and therefore aims to enhance capacity and empower individuals.
- The imperatives are presented in a workbook format (with assignments in each chapter).
- Assignments are focused on both individual and group work.
- This book is a general overview of the research process and it is not targeted at a particular field of study.

These imperatives should serve as a booster to your research career. Through the years the authors have noted that it is not enough to understand the theory of research only. You also need to spend time on what is "behind the scenes". These imperatives will enlighten you on what you may already know, but have never been considered important in planning your research and research career.

This book on imperatives for research is a result of the four authors' engagement with those areas required for the skills development of researchers. It follows on a book by Ulrich and Martina Holzbaur (Die Wissenschaftliche Arbeit: Leitfaden für Ingenieure, Naturwissenschaftler, Informatiker und Betriebswirte, 1998, München: Carl Hanser Verlag) that focused on final thesis projects and also on the series of books on research published by Laetus Lategan and co-authors.

The authors of the present book have worked together and discussed thoroughly the main impact factors of the success of research and of researchers. The collection of the seven imperatives is a consequence of combining our areas of expertise (the result of a focused approach) and team work (sharing of ideas, perspectives, expertise and experience).

The authors trust that the diversity of researchers, research managers and research administrators will engage with the book in such a rigorous manner that they will provide feedback to the authors to update and expand on the ideas and advice in this book.

The authors would like to thank the Southern African Research and Innovation Management Association (SARIMA) for its support of the project and the generous financial contribution to complete this project.

Enjoy reading!

Ulrich D. Holzbaur, Laetus O.K. Lategan, Karin Dyason and *Deseré Kokt*

Aalen, Bloemfontein and Pretoria, August 2012

IMPERATIVE 1

UNDERSTAND RESEARCH AND ITS ENVIRONMENT 1

1. Research: A combination of knowledge, skills and competencies

Science and technology open the world to scrutiny and investigation and enhance our understanding of phenomena and the problems human beings face. Our modern way of life is largely the creation of science and technology. Societies therefore need to enhance their understanding of the world by improving their understanding of science and technology. This demands a vibrant research agenda supported by active researchers, research managers and research administrators. It is therefore essential for every researcher to be well acquainted with the knowledge, skills and competencies required to do research as well as the complexities of the research environment.

Knowledge implies familiarity with someone or something. It usually consists of information, facts or descriptions about a particular phenomenon and can in a research context include subject-related and/or industry-related knowledge.

Skills, on the other hand, refer to the learned capacity to carry out a particular action. Within the research domain two types of skills can be distinguished – general and specific skills. General skills may include time management, teamwork, leadership skills and self-motivation, while specific skills could include scientific writing, planning skills, and verbal and non-verbal communication skills.

A competency refers to a standardised requirement to perform a particular task. Important research competencies can involve performing adequate information searches, synthesising information and applying appropriate research methodologies. Acquiring the knowledge,

skills and competencies to successfully complete a research project could be complex and time consuming and may require patience and diligence on the part of the researcher.

Knowledge, skills and competencies should be carefully considered as potential researchers are often unprepared for the demands associated with doing research, as well as the level of self-development that needs to take place. The mix of knowledge, skills and competencies differs from the early-career (where the focus is on development), to the mid-career (where the focus is on development and mentoring) to the established researcher stage (where mentoring is the main focus). This book focuses on especially the early-career researcher, but also provides perspectives that could assist the mid-career and established researcher, as well as research managers.

Assignment 1.1

Reflect on the research skills and competencies mentioned below. Decide whether you possess the mentioned skills and/or competencies and reflect in the last column on your developmental plans.

Research-related competencies	**I possess this competency**	**I do not possess this competency**	**Developmental plans**
I have core knowledge and comprehension of the key concepts and issues in my research area.			
I liaise and network with other academics, both inside and outside my institution.			
I am creative and innovative in my research endeavours.			
I can apply appropriate research methodologies in solving research problems and questions.			
I have the ability to plan and execute research activities and projects.			

Research-related competencies	I possess this competency	I do not possess this competency	Developmental plans
I am able to cope with the administration associated with research activities and projects.			
I am able to obtain the relevant information for my research.			
I can motivate people.			
I communicate effectively, both verbally and non-verbally.			
I have the ability to manage and improve the performance of others.			
I am able to mentor students and staff members.			
I have adequate knowledge of the research processes and systems in my institution.			
I support the development of research capacity and skills.			

Research-related competencies	I possess this competency	I do not possess this competency	Developmental plans
I am able to place my work in the public domain through presentations, publications and reports.			
I am able to identify and facilitate opportunities for research commercialisation.			
I am ethical in my research practices.			
I support diversity and equality.			
I am fully acquainted with the research focus areas of my institution.			
I am able to identify and facilitate opportunities to obtain research funding.			

2. The research environment

The management and execution of research are driven by institutional policies and procedures. There are two aspects to consider: Firstly, research takes place at individual and/or group level and secondly, the research environment (e.g. the infrastructure, funding, mentorship, developmental programmes) is created and maintained by the institution. The research environment usually consists of an internal (that involves interaction within

the organisation) and external (that involves interaction with outside constituents such as research councils and business and industry) environment. The external research environment has a dynamic impact on the internal research environment, e.g. funding agencies usually have precise prescriptions related to funding categories and how funding must be spent. This will imply that, apart from the institutional regulations, researchers also need to adhere to the rules and regulations of the external constituents. The internal environment is created by the policies and procedures of an institution and the decisions and management style employed by senior and tactical management.

Within – but not limited to – the internal environment, administrative support, infrastructure development and financial support will play an important role in support, development and execution of research. Researchers (and their supervisors), research managers and research administrators should form a team in the execution of the research project. It must be emphasised that without constructive support no researcher can be successful, and that the supportive and developmental role of research managers and administrators is indispensable. This underscores the professional role of research managers and administrators. It should therefore come as no surprise that research managers and administrators ought to have a broad understanding of what research is. This does not imply that they should necessarily have a subject-specific research understanding, but they should have a good comprehension of the broad stages of a research project. In addition, they also need to be able to identify research opportunities and needs and to know how these can be supported. An effective research administrative support system must be in place to provide the necessary information that research managers can use in support of a research project. It may be stated with confidence that researchers, research managers and research administrators all have an equally important role in building a research culture.

Assignment 1.2

1. For researchers: Reflect on the challenges your research is currently facing with regard to infrastructure, developmental and financial challenges.

1. For research managers and administrators: Reflect on how the availability of infrastructure, developmental support and finance can ensure that a researcher's project will be successfully completed.

2. For researchers, research managers and administrators: Discuss in groups your mutual challenges to ensure the successful completion of a research project.

The research supervisor should take a leadership role in shaping the actions and behaviour expected from all involved in the research with a view to developing a research culture.

A research culture implies that researchers, research managers and administrators commit to the development of an enabling research culture. From an organisational perspective, it is important that a supportive research culture be developed. This is generally not possible when rigid rules, regulations and organisational structures exist. It is further imperative that research activities be well planned and that all role players understand what is expected from them. The internal role players could include postgraduate students, research teams, supervisors, research managers and administrators, deans, assessment and even graduation staff.

There is also an external research environment that must be considered. The external environment could include funding agencies, community engagement, research outputs (e.g. publishing in scientific journals and delivering papers at conferences), and the overall impact of the research on humans, society and the environment. Funding agencies (public and private) usually provide financial support to individual researchers, research teams and/or institutions. Funding could include stipends for living expenses, project expenses, upgrading facilities and/or the purchasing of machinery and equipment. Society at large is an important external benefactor of research and research findings should be placed in the public domain. This may involve publications in scientific and/or industry journals and other media as well as national and international collaboration and networking.

Assignment 1.3

1. General discussion: What is your understanding of a research culture? How can you contribute towards the development of a research culture?

2. Specific discussions for researchers: How do you think the research managers and administrators can contribute towards the development of a research culture?

3. Specific discussions for research managers and administrators: How do you think the researchers can contribute towards the development of a research culture?

2.1 Planning research activities

The purpose of research planning is to continuously improve academic activities, especially those directly linked to research and research development. Excellence in research has a bearing on the calibre of students prepared for the labour market and the research skills and competencies of academic staff. The expansion of existing knowledge and the creation of new knowledge in a knowledge driven economy is necessary to meet the ever changing needs of the community that the university serves. The main focus is therefore to facilitate the continuous improvement of a university's research processes, activities, programmes and services in order to maximise its research outputs. In order to reach this goal, the following objectives should be considered:

Objective 1: Integrate research with the mission and vision of the university

Research should be fully integrated with the vision and mission of the institution. This can be accomplished by means of:

- Research policies and procedures

  The research policies and procedures of the university should reflect its mission and vision. They should guide research planning and ensure that intellectual (postdoctoral fellows, research fellows, postgraduate students) structural (equipment, facilities) and administrative (funding, recording and rewarding research outputs and postgraduate equity) aspects are considered.

- Research leadership

  The advancement of research leadership is essential in defining economic, social and cultural strategies which should be a high priority for universities. Societal problems are often complex and involve inputs from a variety of disciplines. A narrow focus to problem solving is not an option and students need to be equipped with technological competencies and practical skills to deal with real-world problems. For this to happen, leadership in technology needs to be developed. This could come from academics or leading figures in business and industry or a combination of the two. The knowledge created through technology application should be transformed into new products, processes and services. The ultimate aim of technology transfer is to benefit the various stakeholders (individuals, government, business, industry and society). This also includes the commercialisation of knowledge that could stimulate entrepreneurship and small-business development.

Objective 2: Research development

Research development is crucial in creating an academic environment that supports and promotes cutting-edge research. Research development needs to be continuous and can include the following activities:

- Research workshops

  Research workshops can upgrade the skills of students and staff. Workshops present excellent opportunities for postgraduate students and researchers to engage with research-related issues and methodologies.

- Research colloquiums

  The purpose of research colloquiums is to engage postgraduate students and researchers in rigorous scientific debates and to expand their comprehension and intellectual capacity in a particular field of study.

- Faculty-based research development

  Presenting faculty-based research development (like the research process or quantitative and qualitative procedures) can mean that tailored programmes are presented to meet the needs of a particular discipline.

- Science writing workshops

  Scientific writing workshops can assist researchers with scientific writing and in publishing their findings in scientific journals. They can also assist novice researchers in getting started and completing their research proposals.

- Visiting scholars

  To ensure an influx of international expertise, visiting scholars could broaden the perspectives of staff and postgraduate students. This enables a university to enhance the national and international character of its research endeavours, and also to build internal capacity.

- Attending national and international conferences

  Exposing researchers to national and international conferences affords them the opportunity to showcase their research and to network with other scholars.

Objective 3: Research funding and administration

This objective includes the following:

- Research funding

  Any university should expand its funding base and there are both private and government institutions that offer opportunities to apply for research funding. It is imperative that suitable researchers be identified and assisted to apply for internal and/or external funding.

- Research administration

  Research administration includes the recording of institutional or external documentation such as research proposals and budgets. Research outputs need to be recorded and

documented. This enables research management to track the progress of the research performance.

Objective 4: Research collaboration and rewards

Enhancing collaboration with colleagues and other universities is an important exercise in broadening the research base of universities. This may involve:

- Identification of potential research partners

  Partnerships, cooperation and joint ventures are imperative when a university wants to engage purposefully with societal problems. The knowledge and insight gained from such interactions should continuously inform teaching, learning and research within the university context. An excellent example of this is the phenomenal success of Silicon Valley, where extensive links were created with four major universities benefitting new knowledge creation. The base of research partners and potential collaborators needs to be constantly expanded and can include national and/or international research partners.

- Rewarding research outputs

  The impact of research needs to be measured and research outputs needs to be rewarded. Rewards should ideally be tangible and the criteria for obtaining rewards should be incorporated into the Performance Management System of the university.

Once the planning phase has been completed universities will be in a better position to manage the research processes and provide assistance to researchers and prospective researchers.

Assignment 1.4

1. Reflect, as research manager, on your expectations of researchers with regard to research planning activities.

2. Reflect, as researcher, on your expectations of research managers and administrators with regard to research planning activities.

3. Specific discussions for research managers and administrators: How do you think the researchers can contribute towards the development of a research culture?

REFERENCE

Lategan, L.O.K. 2011. The death of the intellectual: How can intellectual life be awakened again? *Journal for Christian Scholarship*, 47(3/4): 87-109.

IMPERATIVE 2

PERSONAL DEVELOPMENT AND CAREER ADVANCEMENT

1. Why focus on personal development and career advancement?

The research environment is complex and challenging. Completing a research study takes time, persistence and dedication. If researchers do not possess these qualities, they are not likely to succeed in their research endeavours. It is therefore very important for prospective researchers to have realistic expectations when a research project is contemplated. It is not just about completing a qualification, but also about the personal growth and development that need to take place. A person's personality (the integrated, dynamic organisation of an individual's mental, physical, social and moral qualities that manifests itself to other people) determines how well people apply themselves in a chosen field, team or task. It is generally accepted that personality is inborn, yet shaped by the environment. Aspects that relate to personality are interpersonal skills, communications skills, self-control and how well an individual understands him-/herself and others.

Personality is dynamic and can be influenced by situational factors, which means that individuals can enhance their personal attributes and competencies. It is for this reason important that continuous personal development takes place. When working with other people, it is especially important to attend to one's sense of self-awareness and the interpersonal skills to interact with other people. This relates to emotional intelligence where individuals know and understand their own and other people's emotions, they are able to organise themselves and the environment in which they operate, they have empathy

and maintain good interpersonal relationships. Emotional intelligence is essential in making successful life and career choices. There is general consensus that emotional intelligence consists of self-awareness, self-regulation, motivation, empathy and social skills.

- Self-awareness

  Self-awareness implies that individuals recognise and comprehend their own emotions and feelings and are able to respond appropriately. It also includes likes and dislikes, awareness of one's strong points and weak points that need further development. Self-awareness implies that individuals know themselves well enough to make informed life and career choices.

- Self-regulation

  Self-regulation involves constructive anger management and the individual's ability to control disruptive impulses. It can also include aspects such as integrity and trustworthiness. Self-regulation is an important aspect in maintaining healthy interpersonal relationships.

- Motivation

  Motivation refers to the efforts put into achieving one's goals. Important characteristics in this regard can include drive, optimism and perseverance.

- Empathy

  The ability to empathise with others means that an individual is sensitive towards the opinions and needs of others. Empathy is crucial in maintaining interpersonal relationships, whether in the workplace or in one's personal life.

- Social skills

  Social skills link with empathy and reflect an individual's interaction with other people. In the workplace this could include conflict resolution skills, communication skills, negotiation skills, participation skills and leadership skills. Without social skills individuals will not be able to operate in the workplace or fit into societal structures.

Emotional intelligence should be fostered from an early age – even young children can be made aware of the fact that they have their own preferences, likes and dislikes.

Assignment 2.1

Reflect on your personal development related to doing and/or managing research. Indicate the developmental challenges that you have mastered as well as those you have not yet mastered.

Personal developmental challenges I have mastered.
Personal developmental challenges I still need to master.
How do you plan to master these challenges?

1.1 Career advancement

A career can be described as the work-related experiences that span an individual's life. Choosing a career is no easy undertaking. People have varying expectations regarding the rewards and satisfaction they seek in their careers. It may be that some individuals view work as a necessary evil to earn a living whereas others may view it as a mechanism to enrich and add purpose to their lives. In previous decades organisations were responsible for the career advancement of individual employees. This has changed and individuals need to take responsibility for their own career planning and career advancement. Most research activities (for instance postgraduate studies and managing research projects) have some form of career advancement attached to it. If individuals are aware of their likes, dislikes, strong and weak points they are more likely to make suitable career and career advancement choices.

Assignment 2.2

Know yourself by exploring your likes, dislikes, strong and weak points.

Write down the types of things you would like to engage with as part of your career.	
Write down the types of things you would like to avoid as part of your career.	
Write down your strong points.	
Write down your weak points.	

2. Reflect on your current career and the career advancement you would like to make in the future.

2. Developing researchers and research managers through planning games

It is imperative that researchers and research managers constantly engage in growth and development programmes. Planning games can be a fun way of doing this. Planning games can assist researchers to comprehend the planning and management actions that need to take place to complete a research project successfully. Although planning games may not be familiar in the context of research development, it is a meaningful tool that can assist with the formulation of the research assignment. The following in-basket exercise represents a planning game where managerial skills can be assessed and developed.

Assignment 2.3

In-basket email exercise:

The items in an in-basket email represent typical issues a manager could face on a daily basis. You have two hours to work through the items and decide on the appropriate course of action in each instance. You can delete, ignore or postpone some elements, delegate some tasks by phone, email or by a written memo or just by forwarding the document.

The scenario is as follows: Freddy Flintstone leads a team of four researchers (Anton, Albert, Anna and Beatrix). The following items landed in his mailbox on Tuesday, 11 March 16:00. He has to leave at 17:00 for a conference where he will not have email access, and will return on Monday morning. His research manager is Benjamin Bauer, who reports to the Deputy Vice-Chancellor: Academic (DVC: A), Rudi Ritter.

	Action to be taken	**At 16:xy**
From: Max Miller, To: Anton, Ben. Sent: 23:07 cc: Rudi Ritter, FF, Ref: Congratulations. Anton I am very enthusiastic about the breakthrough you told me about during yesterday´s match. I will ask Marketing to make a TV appointment as soon as possible. Kind regards also to your dad. Max.		
From: Accounting, To: FF Sent: 04:31 Ref: Immediate response. Dear customer, we have billed you R3 216. 33 in excess. Please email your account details to accounting@ accountingoffice.bureau.ru not later than 19:00 today, for a refund.		

	Action to be taken	At 16:xy
From: Rudi Ritter, To: FF, Sent: 07:12 Ref: Report Dear Fred, would you please respond to this urgent request of our VC by not later than 15:00. He needs some information about your research for a presentation early in April and I promised your input by today, 15:00. Thanks, Rudi		
From: Anna, To: FF Sent: 07:22 Ref: Statistics. Dear Fred, in the report about our work, there are several figures which by my assessment are absolutely implausible. I think that Anton has changed them in the course of copying the data. Please do not use the results or data.		
From: Anna, To: FF Sent: 07:32 Ref: Statistics. Dear Fred, I have to leave for a funeral not later than 09:20 and cannot get hold of you. Can you believe that some of the data has been modified? Regards, Anna		
From: Ben, To: FF, Rudi Sent: 08:15, Ref: FW: Colleagues, could you please explain to me who Anton is and why he is reporting directly to our Rector? Please respond before lunchtime. Regards, Ben		
From: EDP, To: Staff, Sent: 08:22 Ref: Shutdown. Dear colleagues, due to a problem with our server, the email system will be down from 16:30 to 19:30. Incoming emails will be stored.		
From: Beatrix, To: FF Sent: 10:07 Ref: Lunch. Fred, what about our planned lunch? You promised to discuss my research proposal. Love, Bea		
From: Accounting, To: FF. Albert, Maria. Fritz, LKL Sent: 11:38 Ref: Travelling expenses/ research funds. Dear colleagues, we have noted that there were some inconsistencies in your travelling reports. As you know, rates for travelling abroad only apply after leaving the country. Please ensure that you claim the correct amounts as we are facing an internal audit on Friday. Regards, Monique Monnaie, secretary to the head of accounting department.		

	Action to be taken	At 16:xy
From: Accounting, To: FF Sent: 11:51 Ref: Immediate response. Dear customer, we need your support to transfer $100, 000 to your country. We will offer you a 10% gratification for your help. Please email your account details to ambassy@bureau.adv.ru not later than 19:00 today.		
From: Anton, To: Anna, cc: FF Sent: 12:07 Ref: Report. Anna, you unfortunately locked the cabinet containing the raw data for our project. Since you are on holiday we are not able to access the data and continue with our work. Could you call us urgently?		
From: Anton, To: FF Sent: 12:07 Ref: report. Fred, I need the support of you or EDP urgently to gain access to my PC. Ritter requested me to send him a summary of my report today. Regards, Anton.		

Planning games does not require complicated responses and can be valuable in the development of especially novice researchers, research managers and administrators. Apart from the developmental actions on individual level, institutional initiatives could also support the development of researchers, research managers and administrators, e.g.:

- providing support for postgraduate supervisors
- mentoring programmes
- technical and financial support for knowledge transfer and research commercialisation
- science writing workshops
- study visits
- delivering papers at national and international conferences
- sabbaticals
- establishing networks both nationally and internationally
- research-related training and development

IMPERATIVE

3

BE THE 'ETHICAL' RESEARCHER

1. Some challenges to knowledge development and its application

Universities worldwide are expected to undertake three core functions, namely the development of new knowledge (research), the transfer of knowledge (teaching) and the application of knowledge (innovation and community engagement). One can therefore claim that universities are primarily in the *knowledge business*. It comes therefore as no surprise that universities – as the custodians of knowledge – must protect and uphold the integrity of knowledge at all times.

This is an easy claim to make. The more challenging part is to 'show' the public that the knowledge business is above suspicion. Take, for example, research and innovation – as these are the foci of this book. Initially it may sound convincing to say that the research project subscribes to the universally accepted rules of ethics for research, such as no plagiarism, no fabrication or falsification of information, having respect for human life, etc. But what about the growing concern for issues such as the quality of scholarship, authorship, contribution to new knowledge, respect for animals, the environment, safety and security, promotion of equality, health and wealth, adherence to the grant conditions, acknowledgement of research methods and convincing research designs? The list is endless. Can we claim that all research bears evidence of integrity?

The problem intensifies when money is involved with knowledge development and application. Claims are made that contract research is more solution and innovation driven and does not necessarily grow the knowledge basis. Some research professors are more interested in commercialising their knowledge and research findings than developing new knowledge or doing basic research.

The training of new researchers is also under siege. The impression is very often created that postgraduate studies are more about possible subsidies for the university and promotion of the supervisors than about the development of a new generation of researchers.

Such comments do not only call into question the integrity of the research activities of a university, they also turn to the heartbeat of universities: scholarship. In a provocative sense, the statement can be made that ignorance of the necessity to keep on creating and developing high quality new knowledge can lead to the "death of the intellect". [For a detailed account of this problem, the reader can follow the arguments and discussions outlined in Lategan, 2011.]

Researchers should respond to this challenge – which is not only of a scientific nature, but also of an ethical nature. The question therefore is how best to respond.

2. The guiding question: What is ethics?

'Ethics' is the science of values and principles. Ethics in higher education focuses on the values and principles operating in higher education. Research ethics refers to the values and principles at work in a research environment. Research ethics is not an add-on to research, but a fundamental part of all activities related with the research process. Integrity is the trust expressed by peers and the public in what the researchers are doing. Integrity signals that the research is above suspicion.

It should be noted that ethics in science is not an abstract activity:

- Ethics is analytical – the ethical challenges should be well comprehended.
- Ethics is proactive – decisions should be made.
- Ethics is of an applied nature – the decisions following on the ethical issue should be implemented.
- Ethics has a developmental approach – the consequences of the ethical decision should be reviewed to verify that the right approach was taken.
- Ethics has growth as objective – it should contribute to researchers' personal and professional growth.

Ethics cannot be without a philosophical framework – something which is very often neglected and as a consequence, results in a post-modern or a post-structural framework. The latter is based on the philosophy that anything goes – there is no right or wrong answer. A philosophical discourse is fundamental to the design of an ethical framework to reflect on values and principles in research. It is an agreed principle in the philosophy of science that the way in which ethical decisions are implemented, is influenced by our world view and our ethical paradigms. The following table illustrates the focus of the different world views on ethics (external view) and some paradigms of ethics (internal view). [The reader can follow the comprehensive background to this table in Van der Merwe, 2002]:

World view/ paradigm	Contents	Slogan	Problem
Behaviourism	People are trained how to behave.	I couldn't help myself.	Everything is reduced to cause and effect.
Utilitarianism	Morality is useful if it can bring about a desired result.	The greatest happiness for the greatest number of people.	What is right cannot be determined by a majority vote, but should be based on sound principles.
Result ethics	It's the result that matters.	Do good.	Cannot know whether a decision is good or bad until the results are known.
Intentional ethics	It's the intention that matters.	Mean good.	No way to know the true intentions of anybody.
Situation ethics	The relevant norm arises from the situation and no universally valid laws are possible.	All you need is responsibility/ reflection.	All norms are relative to one absolute: love.
Natural law ethics	'Natural' denotes the idea of "how things ought to be" while 'law' refers to the consistency in the way the world should work.	Doing what comes naturally.	Difficult to distinguish between human and natural behaviour.
Divine command theory	An authority-based theory.	God said it; I believe it, which settles it.	It denies individual behaviour, the role of reason and religious interpretation.
Virtue ethics	The quality of one's character will influence the behaviour.	Be good.	An act is only good if you are good.
Kantian ethics	Some things need to be done because it is the right thing to do.	It is one's duty.	Duty for duty's sake.
Ethical egoism	Do only those things that will be advantageous for yourself in the long run.	Look out for number one.	Over-emphasis on self-interest.
Cultural relativism	Culture influences your ethical behaviour.	When in Rome, do as the Romans do.	Ignores the role of universally accepted norms.

Assignment 3.1

On the basis of this information, engage with the following activity:

1. What are the issues in ethical research?

2. What influence do new research developments have on the application of research ethics?

2. Is research ethics only about making a choice between right and wrong?

3. The importance of an ethical orientation

Two of the best known case studies in corporate business are Boyen McCoy's "The parable of the Sadhu" and James Burke's "Johnson and Johnson" case. These two case studies illustrate convincingly that business requires leadership, personal commitment, loyalty and care. This should also be evident in a research environment.

Ethics and integrity are now more than ever demanded by a "free-wheeling society" where the impression is created that unethical behaviour is acceptable. In an environment where research is regarded as "big money," research communities are expected to implement values and principles, to be known for their ethical commitment and behaviour. The well-known dictum "tell me how good you are" has now been replaced with "show me" how good you are.

What is notable in the debate on ethics is that without a personal commitment to acceptable values and norms, ethical behaviour will never make any significant impact towards the way in which we deal with the challenges of the research community. Ethical codes are the expression of desired behaviour. But ethics is a unique science which commands theoretical knowledge, decision making, application and impact assessment. Moral leaders cannot be afraid to make sound decisions.

Core to ethical behaviour is personal commitment and integrity. The proverbial buck cannot be passed.

Contrary to J.-P. Sartre's comment that ethics is meant for holy men and monks only, researchers should show that they can live up to the ethical needs of the research society. Researchers must have the ability to give effect to Hotspur's comment in Shakespeare's *Henry IV*: "I can teach thee … to shame the devil by telling the truth: tell truth and shame the devil."

Assignment 3.2

On the basis of this information, engage with the following activities:

1. Does the research leader have a greater ethical responsibility compared to a junior member of the research group?

2. Should a researcher inform the university's management if he/she has (sensitive) information available, that might influence the way in which research is executed?

3. Do attitudes and behaviour have an impact on ethical orientation?

Choose an example from your research or a prominent example from history and discuss the following:

1. What is the difference between an ethical decision and a pragmatic solution?

2. Are all decisions in a research group really ethical?

3. Are all "ethical research decisions" in a research group ethical?

4. Are the decisions made within the group, made by the leader or by external persons?

4. Framework for an ethical code for research

Researchers and their research groups should subscribe to an ethical code. The following guidelines should be considered in setting up an ethical code:

- Institutional ethos

  What is the research group's view on the university's core functions? Institutional values such as entrepreneurship, technology, the academic enterprise, social responsibility, etc. will influence the drafting of an ethical research code. Ethical research codes should adhere to an ethical code based on humanity, individual and community rights, environmental sensitivity, political democracy and the academic principles of freedom, autonomy and intellectual scholarship.

- The research group and its communities

  Through its research, a research group is interlinked with external communities ranging from students, staff, government and industry to corporate companies and social communities. Communities are characterised by a diversity of cultures, languages and religions. Ethical research codes must therefore not be blind to diversity when an ethical code is set up. In addition, when a code is designed, it must of necessity honour the values and principles of its academic enterprise.

- Accountability

  Public higher education institutions should be committed to meeting the objectives of their government's national priorities for research and innovation. Public universities are also accountable towards building a new citizenry for a new nation.

- Academic standards

  Research should live up to the highest standards associated with the research practice. In research it is all about using the best methods and research designs, supported by infrastructure and resources, to invent new solutions to academic, business or industry problems. Research is practised within a scholarly context, and characteristic of such a context is the integrity with which the research assignment is executed.

- Individual behaviour of staff

  It is expected of staff to practise their profession according to the code of their profession, principles of the academic enterprise and the ideologies of the academic enterprise in general and that of their research groups and universities in particular. In this regard, staff should at all times remain abreast of the latest developments in their field of study. As people working in a university, it is expected of researchers that they will contribute towards the encyclopaedia of knowledge. Following from this, researchers should also foster the academic culture of freedom in academic discourse and therefore protect copyright, honour the privacy of data, secure the accuracy of data triangulation and enhance the right to intellectual property. This can only be accomplished if researchers have access to information, fellow staff members have access to colleagues to debate matters in a scientific discourse, and individual opinions are respected. All of this is based on individual self-censorship and not regulation by any authority. Researchers should at all times abstain from malpractice in any form at any time.

Assignment 3.3

On the basis of the proposed framework, engage with the following activity:

1. What role does individual versus group ethics play in research ethics?

2. Should corporate ethics allow for individual religious orientation and convictions?

3. Is the group more important than the individual?

4. Do communities/corporations influence ethical attitudes?

5. Should religious orientation play a role in a company's ethical attitude and behaviour?

5. Pointers

The following pointers can be identified that may be regarded as useful in practising research based on acceptable values, principles and integrity:

- Paradigmatic choices

  Although academics should be free to select the paradigm for their academic work and to form their own findings and conclusions, these findings and conclusions should be available for scrutiny and criticism.

- Dictum of do no harm

  Researchers should commit themselves to the ethical dictum of "do no harm" in all their activities.

- Relevance of research

  Research activities should be informed, relevant and contribute towards implementable and useful knowledge.

- Avoid power relationships

  Research activities should be free from any form of power play and harassment.

- Integrity of data

  Data should be reported accurately and should not include fabricated data or falsified results in any report, assignment or publication.

- Use of data

  In the collection and use of data, staff and students have an obligation to take steps to safeguard the privacy of participants and to ensure that data remain confidential.

- Authorship

  Any person accepting authorship accepts responsibility for the validity of the whole manuscript. Authorship should be limited to individuals who have made a significant contribution to the research.

- Funds and equipment

  Researchers have an obligation to use funds and/or equipment for the purposes for which they were awarded, to execute the research assignment and to enhance the development of knowledge.

- Risk

  Risk that can endanger the lives of the research subject or do harm to the environment should be avoided at all times.

- Conflict of interest

  Researchers should not allow a conflict of interest to derail the trust of the public or fellow researchers in what they are doing.

Assignment 3.4

On the basis of all of these arguments and perspectives, engage with the following application of your newly gained perspectives and knowledge:

1. Each reader must define what research ethics entails.

2. Design a research ethics framework which is tailor-made for your current research group.

3. Draft a 50-100 word case study (based on current or previous dilemmas in research) and apply your definition of research ethics to this case study.

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IMPERATIVE

4

DEVELOP YOUR PLANNING SKILLS

1. Planning

Plans may not be safe from failure, but without planning failure will be inevitable.

The focus of the strategy in this imperative is to plan ahead. Strategies involve planning and vice versa, so you could also call this imperative "planning strategically". Moreover, planning and models are interrelated, so planning as a strategy in research does not only mean to plan on a model basis but also to consider scientific models in the planning.

The main focus of planning with respect to research is to plan your research strategy and to identify, plan and control your research projects. The strategic planning of your career was incorporated in Imperative 2.

Every research is a project. This project should be planned according to standard project planning principles. The well-focused execution of a research study requires at least a work structure plan and a definition of the most important milestones. At the start, a short description of the task and a timetable should be set up. The plan and timetable must be considered on a continuous basis.

Planning plays an important role as it also involves:

- The identification, planning, implementation, control and finalisation of research projects;
- Long-term strategic planning or a larger research campaign involving several research projects;
- The planning of an academic career and the development of the researcher. This was pointed out in Imperative 2; and

- Planning to utilise the results of the research projects: bringing them to the scientific community and to the real world. This will also be pointed out in subsequent chapters: On publication (Imperative 6), communication (Imperative 5) and transfer (Imperative 7).

Assignment 4.1

Write down where you would like your research to be in three, five or 10 years.

2. Model your plan – the model-based future

To plan means to develop a model of the future. This model is always twofold: the future status (the vision) and the way to reach that status (the plan). Research is not just contemplating for half a year and then writing down the results – it is a guided process.

The most important items and considerations in planning the future and planning for future tasks are:

- vision and aims (where do I want to go?);
- framework and restrictions (what can impact on my future plans?);
- resources (how can I achieve the goals?); and
- timelines (when should the aims be achieved?).

Planning is led by a goal and guided by a path – nevertheless this is not like a railroad that gives you the exact path. It is more like having lights that help you to find your way. And plans must have alternatives and must allow you to react to opportunities – for a researcher it is important to be opportunistic; if an unexpected finding comes up, this could lead to a new field of research.

Assignment 4.2

Assess your own future plans:

Vision and aims (Where do I want to go?)	
Framework and restrictions (What can impact on my future plans?)	
Resources (How can I achieve the goals?)	
Timelines (When should the aims be achieved?)	

3. Model planning in research

In science, a model is usually a formal system – normally based on mathematical formalisms – that is used in order to analyse the object of our investigation. Hence, a model always needs a formalism (syntax), a relation to the 'original' system or 'reality' (semantics) and the use for which it was made (pragmatics).

Modelling and research go hand in hand. Therefore, it is important to realise in a very early phase of the research process, that models will be needed to assess –

- The forthcoming complexity, mathematical rigour and the level of formality of the syntax: Will it be a formal mathematical system that can be analysed via formal methods or simulation, or just a basis for discussion? Can it be understood by people working in the field or will it be overloaded with formalisms and symbols?

- The field of applicability of the model: Will it be a very specific model that can serve as a case study or to handle just one object, or will it have a rather generic semantic that allows the use of the model in a broad area of applications?
- The intended use (pragmatics) of the model: Will it serve for formal analysis or simulation, for prediction or explanation, for evaluation of the past or design for the future, for decision making or just for communication? How will it be possible to test the model for falsification?

Typical examples of how researchers can deal with models are:

- to define a new model (model type, model instance);
- to adapt the model to a specific field of theory or application;
- to refine a model by adding specific aspects;
- to combine models;
- to derive results from the model;
- to validate a model (by means of a case study or an attempt to falsify the model);
- to test the model against realty (verify or adapt); and
- to define a prescription or guideline (which in itself is a model) for a specific type of problem.

Note that a computer software programme can also be seen as a model – one that can be executed by a computer.

Assignment 4.3

1. Which models play a role in your research?

2. Which type of model will be the result of your research?

3. Show your research outcome as a graphic model.

4. Projects

For research managers and administrators, the need to apply project management principles to research is obvious. Regardless of the type of research, timeframes and resources must be allocated to ensure an optimal chance of success.

Assignment 4.4

Are you familiar with project management principles? What is your understanding of a project and its principles? Before we discuss this in more detail, first describe one of your (research) projects in terms of outcome, time and resources.

Nature of project	Identified outcomes of project	Time frames	Resources

4.1 Project management and project manager

A project is a well-defined activity that is unique (not a routine task). This means that the project has a specific aim and therefore is limited with respect to its duration. A project is essentially characterised by the uniqueness of its nature, goals, aims, target audience and team participating in the research. A project is also characterised by the criteria, novelty of aims (innovative task, novel results), approach (new methods) or type of limitation, complexity of result and aim achievement, uncertainty due to uniqueness or limitations of time and resource allocation.

Novelty, complexity, and uncertainty refer to the three core factors of project management (see magic project triangle in paragraph 4.2):

- result (quality, project aim);
- resources (ways and means of reaching the aim); and
- time (target date).

Project management makes a number of methods available for performing research successfully.

- Timeline planning, phase concepts, milestones, network scheduling techniques;
- Task structuring and resource planning, work breakdown structure, project and communication structure; and
- Project controlling, reporting and documentation.

The central person in project management is obviously the project manager. Sometimes there is a differentiation between the external project supervisor, sponsor or facilitator (providing resources and reporting to top management or stakeholders), the internal project leader (being the head of the project, responsible for overall targets and decisions) and the project manager (doing the detailed planning and controlling).

Managing a project involves:

- Setting and discussing targets with stakeholders (customers, management, supervisor);
- Thinking in terms of results and phases, rather than time periods and sequences;
- Being able to deal with uncertainties and handle planning time variables; and
- Being able to lead team members, even when not holding a formal position.

The success factors for any project manager lie in an overall combination of expertise: knowledge of the field, the matter at hand, the facts; methodological competence: methods, applications, problem-solving ability; social competence: dealing with people, responsibility and assertiveness; and personal competence: personality, motivation, and self-management.

This also applies to a researcher working on his/her own since project planning is also necessary for one-person projects, and cooperation is necessary in almost all research projects.

4.2 Project triangle

The magic project triangle or triad is formed by three corners, each representing one of the project determinants. The corners of the project triangle are:

Q = Quality, result (qualitative and quantitative)

- vision and aims: desired final status, final product, project result
- creation of value: positive contribution of the project
- quality: measure of achievement, product quality

R = Resources

- money: cost of resources obtained on the free market, or from internal cost accounting
- time: working time, product or staffing time
- staff training, knowledge, motivation, availability
- hardware, software, infrastructure

T = Timeline

- time: calendar time (months, days)
- timeliness: precision, probability of time overrun

Figure 2: Magic project triangle.

It is advisable that at the start of the research project, student and supervisor should be clear about the elements of the project triad regarding expectations on both sides. Their expectations have to match; otherwise the project will not be brought to a satisfactory end.

Assignment 4.5

1. Describe one of your (research) projects by (quantitatively) outlining the three corners of the project triangle.

2. Are there different project triangles from the point of view of project leader, project team and external stakeholders?

No corner of the project triangle can be altered without affecting the other two. The project triangle is taken into consideration in planning: No corner can be planned independently; monitoring – monitoring only makes sense in relation to the corners; controlling – alterations must take all corners into consideration; and evaluation (the project result is evaluated not only with respect to the quality of the result but also to timeliness and budgeting).

Assignment 4.6

Consider any project that started a year ago. Compare the project triangle then and now.

4.3 Early and final phases

The limited time available for doing a study requires well-focused procedures. Scientific work requires basic reading ("standing on the shoulders of giants") and final verification. Hence, there should be an orientation phase at the start of work in which the available information should be gone over (literature, previous studies). Sufficient time should be provided for checking the results (formal checks, tests, critical evaluation, verification and validation) and for documentation.

The early phases are extremely important, since directions are taken and decisions made at this point. The project team has to clarify collectively, at the outset of the project:

- working aims (general and specific contents, time framework);
- distribution of required roles/functions;
- ground rules of discussion; and
- determination of reporting procedure.

The earliest phases are the hardest to structure and formally describe. Moreover, problems are not yet perceived very clearly. However, with respect to all three corners of the project triangle, directions are set:

- The result is determined to be the goal. This has implications for the chance of project success, scientific result and also for the project evaluation and possible examination aspects.
- Resource requirements (work/expense) are often underestimated, while the available resources (time) are overestimated. Since the means (work/costs) are defined in the early phases (at 20% time elapsed, 80% of the costs have been determined), resource problems tend to show up towards the end of the project.
- The time available looks to be ample, and especially the tasks occurring in the later phases are underestimated. Due to unclear and too spontaneous definition of aims,

means and methods, redefinition becomes necessary – and that makes it difficult to meet fixed dates.

The early phases – the activities at the project outset – are decisive for the success of the project.

The final phases of validating results, communicating results and compiling lessons learned are also important. Sufficient time and effort must be planned for these activities.

5. Planning the resources and structuring the work

Although timelines are mainly perceived as planning instruments and timeline overruns are most obviously perceivable, resource planning is the most important task. Resources such as human capital, infrastructure and finances should be considered when the project is planned.

5.1 The work breakdown structure

Project planning is based on work-package structure (work breakdown structure, WBS) and on milestones. Networks and cost estimates are based on this WBS. [For detailed descriptions and templates, see Lategan & Holzbaur, 2009.]

The WBS describes the total task and divides it in a hierarchical way into small work packages. The term 'work package' (WP) is sometimes only used for the lowest, irreducible level of the WBS but in fact it also applies to the summary tasks. This makes sense since in the course of planning and successive refinement any work package can be divided into several sub-packages.

5.2 Development of the WBS

The WBS exhibits the structure of the work to be performed in the form of hierarchically organised work packages. The structure can be used for:

- resource planning;
- delegation of responsibility (assignment of subtasks);
- creation of a network schedule based on the tasks; and
- planning and control (network, project planning/monitoring).

The work packages are generally numbered according to a hierarchical decimal structure. The resulting maximum number of nine sub-packages for each work package helps to keep things concise. The WBS can be prepared graphically by using a hierarchical box structure, such as in an organisational chart, or in a semi-graphical presentation by indented lists and/or indented text.

A meaningful work package should adhere to the following criteria:

- There must be well-defined aims and tasks.
- There must be a well-defined result in the form of a final document or final presentation.

- A review or audit must be done.
- There must be well-defined requirements.

After compiling the first draft, special project management software or general computer programmes can help with the structuring. Usually, the plan arrived at will be modified several times before it can provide a solid basis for further planning. Also the work structure plan will be extended and altered over the course of time.

The setup procedure can take a top-down or bottom-up form.

Setup bottom-up:

- collecting, structuring, and combining all necessary activities
- for each work package, ask the question: ”What else do I need?”

Setup top-down:

- structured from the top downward
- branching out from the main areas of activity and main components. The sequence of the top levels may vary (product – task area – phase).

5.3 Work packages for academic research

For academic studies, the same principles apply as for other projects. However, since the study usually culminates in a written paper, work has to be structured to fit this goal. The entire study to be performed within the project must be broken down into work packages. In doing this, the above-mentioned criteria must be borne in mind.

Generally speaking, the WBS in research projects is based on the phases of the project, i.e.:

- Literature study
- Planning: idea, experimental planning, concepts
- Preparation: implementation, experimental setup
- Execution: experiments, tests, survey, calculation
- Evaluation, tests and verification of results
- Formulation of the results

Once suitably adjusted, this structure can also serve as the top level for a hierarchically organised work structure plan.

Structuring a research project should mean structuring the work and pointing out which activities (analysis, survey, tests, etc.) are necessary, rather than structuring the final paper. The outcome should be a hierarchical structure with two levels and a decimal ordering (resembling a document). To start with, however, a graphic representation of tasks and

subtasks (hierarchical chart) is adequate. The WBS is easily derived by repeating the question, "What must be done to achieve this goal or to answer this question?"

6. Effort and cost estimates

Planning is based on uncertain values. Good estimates can only increase precision and reduce risks; there is no certainty.

The basis of effort estimation is the personnel resource: the product of time x personnel. The person-day may be a controversial measure of productivity in industry, but for research it is the only viable basis.

6.1 Successive refinement

The WBS will be extended and altered in the course of time. Especially in Research and Development, the evolution of a WBS takes place for two reasons:

- Successive refinement of the plan during the course of the planning process. The closer the realisation of a work package comes, the more detailed the planning can and must be. Work packages in the far future cannot and should not be planned in too much detail.
- Increased knowledge according to the project activities. In Research and Development the project itself creates new knowledge that will make it necessary to modify the plan. Most often only this knowledge will allow the plan to continue and will define follow-up steps and work packages.

Assignment 4.6

Form a team. Discuss the following question: How much money (in the form of coins) is in the team's wallet?

The estimate will be in several phases:

1. Each person writes down his/her estimate.

2. The estimates are collected and written down (blackboard, projector).

3. The individuals with the lowest and highest estimates explain their rationale.

4. Each person may revise his/her estimate.

5. The revised estimates are written down.

6. From 2 and 5, estimates for the amount of money are calculated. In an advanced environment, standard deviation and confidence intervals may be determined.

7. Each person counts the amount of money (in the form of coins) in his/her wallet. The true value is then determined.

7. Scheduling

Next to resources, timelines and milestones have to be planned.

7.1 Network plan

A network can be created on the basis of the WBS. For this, the WBS has to be refined in such a way that the work packages used have well-defined durations. Furthermore, the information on which tasks have to be completed must be collected before the next tasks can start. From that, the network schedule with earlier and later start and end time for each task can be calculated.

7.2 Milestone plan

Milestones are fixed dates that must be defined by a measurable result. The result can be in the form of criteria, such as:

- review
- document acceptance
- test passed successfully
- end of a phase
- finalisation of a work package

A milestone has been reached, or the phase is completed, when the result is finally achieved, verified and accepted.

Milestones are relevant for external aspects such as:

- payments (e.g. within a grant);
- gateways (go/no go decisions); and
- important decisions and determinations.

7.3 Determining the milestone plan

If a network plan is provided, a milestone plan can be adapted using as a first version the earliest finalisation dates of the important tasks. Even if no network plan is created, a milestone plan should be. It may be based on the work structure plan or on a simple division of the work into phases.

Milestones have to be well defined, i.e. it should be clear what result or criterion must be met in achieving the milestone. A criterion such as "six weeks contemplation" defines neither a phase result nor a valid milestone. The most useful milestones are reviews or audits. They can be performed formally or simply in the form of a presentation for colleagues (peer review).

7.4 Milestone plan for scientific work

The following list describes the milestones generally necessary for a research project:

- All planned meetings with study leader and supervisor – decisions and quality gates.
- Clarification whether topic is available.
- Start literature review.
- Start equipment procurement.
- Definition of topic, content, aims and extent.
- Study outline (research plan, project plan).
- First structure – draft model.
- Results ready for final verification.
- Completion of contents, results verified.
- Text completed and proofread.
- Text ready to print, document delivery.
- Deadline (for project customer and examination office).

8. Project control

A project has to be planned, constantly monitored, and brought to a successful conclusion by taking appropriate control measures. Estimates have to be constantly adapted to changing circumstances, so that with time, planning becomes better and more precise. The project data have to be gathered and compared with the planning.

8.1 Project monitoring

Reporting paths must be structured around project structure. Reporting must include:

- information on work packages completed or in progress as well as milestones;
- information on allocated resources and determinations regarding resource allocation; and
- information on unusual events and problems.

Each of the three corner points on the framework of the project triangle has to be planned and monitored. Monitoring is simplified if the estimates have been done at the work package level and can be monitored there:

- Timelines, milestones and durations in the network plan.
- Cost and resource consumption for the work packages.
- Quality features and work package completion.

For work packages in progress, the estimate can be adapted: the relation between the estimates for the work packages and the duration, costs, and results corresponding to the current degree of completion will give an indication of the duration, costs, and results to be expected. Performing this extrapolation is not always easy or clear.

8.2 Milestones and monitoring

Milestones are fixed dates in time. They have to be defined by a measurable result. The result can be formalised in the form of criteria, such as:

- review
- document acceptance
- test passed successfully
- end of a phase

8.3 Monitoring estimates

Estimates should be monitored and improved as part of project control. The same technique can be used to monitor the estimates for data that are part of the scientific result. An estimate is not absolute but is dependent upon the current state of information.

Thus, the following parameters may be assumed:

- The precision of estimates increases in the course of time as information increases.
- An estimate should not only provide a value that is most probable (modus), as likely under- or overshot (median), or that is the average outcome (mean), but should also provide a measure for the precision. This can be in a verbal form, as a standard deviation or an interval within which the value will lie with some given probability (50%; 90%).
- An estimate cannot be more meaningful than the definition and method for measuring the factor to be estimated (residual uncertainty).

An estimate (prognosis) should always be stated as having an interval of reliability.

Assignment 4.7

1. From the point of view of a researcher, write down the most important indicators to describe the performance of a research project. Also write down an acceptable and desirable value for these indicators.

2. Next, from the point of view of a researcher or team manager, analyse the following: How can you improve these indicators? Which external influences affect those indicators? Finally, try to derive indicators, that are really SMART (Specific: relates to the project and the team; Measurable: there is a process defined to calculate the indicator; Achievable: it can realistically be done; Time related: at some point of time you can decide about the value).

8.4 Project control measures

Each of the three points within the framework of the project triangle is the object of control measures –

- Timeline: postpone, reschedule.
- Resources: increase budget, add members to the team, outsource tasks or purchase equipment.
- Quality: adjust performance and quality features.

Imbalances in the project triangle can have various causes that require different measures to remedy them. Causes and measures can affect the time and resources already used up, the quality of the result respecting the degree of task fulfilment, and the expected final outcome. Control measures should be put in place as soon as possible. Contrary to classical control theory, project control cannot be done by simply increasing the value of some input variable (staff, money) since this is also part of the magic triad. Hence, project control involves replanning and rescheduling and a redefinition of the magic project triangle.

9. Finalisation

No job is finished until the paperwork is done: a research project is not completed by the mere handing in of the document. The finalisation of the project and the determination and documentation of lessons learned, form an important step in the success of the current and forthcoming projects.

There is a story about a man who met a woodcutter in the forest, who worked very hard. He tried to chop down a tree but his axe was blunt. So he was sweating a lot but without any success. The man asked: “Why don’t you sharpen your axe?” The woodcutter replied: “I have no time to sharpen my axe; I have to chop down the tree.”

“Sharpening your axe” is important in two phases:

- At the very beginning (early phases), when you have to start defining and planning.
- At the very end when you have the knowledge and experience to prepare for a better project next time.

Assignment 4.8

In regard to the research projects that you have finalised, write down –

1. What was the most important lesson you have learned?

2. What was really supporting you?

3. What was the biggest mistake you have made?

4. What was the most effective external impact (negative, positive)?

Assignment 4.9

Referring to the project you described at the beginning of this imperative, write down the project characteristics in terms of outcome, time and resources. After having done that, compare with your initial description.

Initial project:

Nature of project	Identified outcomes of project	Time frames	Resources

Final project:

Nature of project	Identified outcomes of project	Time frames	Resources

Comparison of initial project with final outcome:

Nature of project	Identified outcomes of project	Time frames	Resources
Initial project			
Final project			
Differences			

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IMPERATIVE

5

PRESENT YOUR RESEARCH RESULTS

1. The purpose of a presentation

There are different approaches to the presentation of research results. It may be done in verbal, poster or written form. Nevertheless, all of these are part of the scientific communication process. Scientific writing will be discussed under Imperative 6: Get published. Imperative 5 will focus on oral/verbal and poster presentation of your research results.

The exchange of information amongst peers is essential to achieve the intent and goal of research – to advance the state of knowledge in a particular field. Presentation of research results before a gathering of knowledgeable people is, aside from written publication, the most important method of making results public. It might actually be the most significant way, as the immediacy and direct contact with an audience is a most effective method of communicating because it leads to immediate feedback.

It is clear that the central purpose of any presentation is communication. If the communication is flawed, science is not facilitated (Lairmore, 2008). Irrespective of whom the audience is, you should provide a sense of what your research is about, get feedback on your work and make the audience want to learn more about what you do (McDaniel, 2010). To do this, you have to make the relevance of your work explicit to a particular audience. Reasons for presenting your work can include:

- engagement with peers to get feedback on your work;
- motivating your work to government(s), potential funders or business executives;
- keeping stakeholders informed; and
- keeping the public informed.

In addition, a presentation can be useful in a number of ways, for example:

- preparing for a presentation forces you to organise your thoughts to make them communicable;
- presenting your results gives immediate access to an audience who can provide constructive criticism and inspiration;
- presenting your results makes you a member of the scientific community, thus giving you access to networks and information;
- it offers an opportunity to gain experience in defending your position, thinking critically and arguing a point; and
- it offers an opportunity to communicate knowledge and its contribution to society.

There are many specialised books that offer detailed guidance on preparing presentations. The information provided in this section does not attempt in any way to be a substitute for any of these books or publications, but intends only to highlight some of the important practical points in presenting your research.

2. The aims of a presentation

The aims of a presentation are characterised by the following three components (Latin keywords):

- *Docere*
- *Movere*
- *Delectare*

2.1 *Docere*

Docere (to teach/instruct) means to convey information, knowledge, and technique. The presenter also wishes to convey understanding and insight into relationships. It is important to remember that –

- The listener can rarely remember everything that is said – it is your responsibility to ensure that they will indeed remember the key message(s) of your presentation; and
- Not everything the listener remembers was actually said. The listener interprets what he/she hears; draws his/her own conclusions, and fits it all into his/her own conception. He/she thereby selects (chooses, represses the unpleasant, amplifies the interesting) and adapts (based on his/her previous knowledge and expectations). Complex chains of thought, multiple negations, irony, and unclear formulations can support these effects. The listener has to be placed in an appropriate state of mind by means of systematic organisation of the presentation – they have to be led to decode the message(s) you intend to convey.

2.2 *Movere*

Movere (to move/set in motion) means to convey wishes and goals. The presenter desires to move something and makes direct or indirect appeals to the listeners.

The goal of moving the listener to a particular reaction is implicit in any research presentation (recognition, cooperation, advancement, calling), whether when speaking before sponsors (funding) and evaluators (recognition of success, advancement, selection), or during examinations (success, grade).

2.3 *Delectare*

Delectare (to please/to delight) means to arouse positive feelings among the listeners, to motivate them, to leave a good impression, and to build trust.

As a sales technique, this often means creating a sense of bonding; in scientific talk, a positive relationship between presenter and listeners is an important criterion for success. Without this positive relationship, the presenter, and thus the talk, will not find acceptance. The power of such a positive relationship between the presenter and the audience should not be underestimated.

Assignment 5.1

1. Define an audience and an occasion.

2. Prepare a presentation on "Who am I?"

3. Deliver this presentation to the audience described in question 1 in exactly one minute.

3. Understanding your audience

As you develop your presentation it is important to keep your audience in mind. There are two aspects to the audience that you need to consider. You have to understand what the vision and mandate of the organising body of the particular conference or meeting is – what is this event all about and how should my presentation align with that? Then consider the listeners – exactly who are the people you wish to inform and receive a response from?

The audience is rarely homogeneous and the level of the presentation should suit everyone – at the start, all listeners should be able to follow it easily and, by the end, even the most experienced ones should have learned something new. The trick is not to bore either group at any point. The ability to communicate your work effectively to a wide range of people is an extremely valuable skill. There is, however, more to understanding your audience than just knowing their level of knowledge.

Audiences can be made up of very different people – people with different views, from different backgrounds and contexts, and with different reasons for listening to your research. These differences will influence what you present and how you present it.

To understand your audience, you need to ask yourself questions such as the following:

- How many people will be in the audience and where do they come from?
- What are their functions in their organisations?
- At what level are they appointed?
- Why are they interested in my work?
- What do they have to know at the end of my presentation?
- How long should my presentation be?

It might not always be possible to obtain all the answers to the questions about your audience, and if this is the case, you will have to make an intelligent guess about them. Where possible, try to put yourself into the shoes of the people in your audience – and see yourself from their point of view.

The summary below shows how the three components discussed in the previous section are applicable to different types of audiences. The + indicates the focus on a specific component for a specific audience. For example, for a speech or an address, the focus will primarily be on entertaining the audience, while a lecture will aim to convey information.

	DOCERE **Conveying information**	***MOVERE*** **Influencing**	***DELECTARE*** **Entertaining**
Speech, address	+	++	+++++
Specialised talk	++++	+	+++
Lecture	++++++	+	+
Presentation	++++	+++	++

	DOCERE **Conveying information**	***MOVERE*** **Influencing**	***DELECTARE*** **Entertaining**
Application	++	++++	
Political speech		+++++	+++

Below are some examples of types of presentations and the associated audience.

3.1 Presentations to colleagues and specialist audiences

Presentations to peers provide an essential benchmark for and feedback on your research. This is important for your career development and for recognition by peers. For these types of presentations your statements are very important since most of the people will be interested in your science – they will want to understand what you have done and how you did it.

3.2 Defence of thesis

It is standard practice in many parts of the world for the author of a thesis to defend his/her work. As an example, the author must, in the space of 10 to 45 minutes, explain the context, aims, methodology and results of his/her research as well as the consequences that follow from the results. Subsequently, the listeners can ask questions and the author must elaborate and defend his/her work against criticism.

The presentation and discussion will make an impression on the listeners and examiners with regard to the quality of the work and can influence the examination result.

3.3 Presentations at research seminars and conferences

Presentations at conferences and seminars pursue several aims which include:

- Making results public and obtaining discussion and criticism from qualified colleagues; and
- Advertising for funding, as well as to gain recognition for the author and his team.

The audience will have a common interest in your results and therefore collaboration and a common understanding is an essential outcome of your presentation. The audience will most likely be familiar with how science is conducted and with some technical terms. Even so, steer clear of terminology that is too technical, scientific jargon and acronyms.

Your presentation should include:

- Formal proofs and/or deductions with literature citations;
- An explanation of the context of your work – how does it differ from what has been done in the past, what is unique or novel in your approach?
- Exact data and statistical analysis from which conclusions can be drawn;
- Reflections on plausibility and plastic explanation; and
- Conclusions, consequences, and practical application.

3.4 Poster presentations

A poster is simply a static, visual medium (usually of the paper and board variety) that you use to communicate ideas and messages. The difference between poster and oral presentations is that you should let your poster do most of the 'talking'; that is the material presented should convey the essence of your message. Academic research posters have become a prominent and integral part of conferences of all academic disciplines.

Furthermore, the scientific poster has become an important vehicle also for scientists to obtain funding for research projects. Academic posters can act like magnets for industries to locate innovative ideas in the pre-publication phase of academic research. This is illustrative not only of the transfer of knowledge but also of the marketing force of scientific academic posters.

At any conference all posters compete simultaneously for attention. It is, therefore, imperative that 'something' about a particular poster has to appeal to the viewers in order for them to stop and look more closely. In order to achieve the desired impact, the poster has to achieve instant visual contact with the scientific viewer who expects a high degree of technical brilliance and accuracy in the ensuing interaction. Once the attention of the viewer has been captured, it has to be managed by the design of the poster. This process requires skills beyond that of the graphic technician.

There are five principles that contribute to the design of a memorable poster:

- Attention getting
- Brevity
- Coherence (theme)
- Direction (simple and focused)
- Evidence (credible to critical audience)

3.5 Presentation to non-scientific audiences

Clear and concise communication on the level of the audience is essential. This implies that a complex topic often has to be greatly simplified. Non-technical audiences often struggle to comprehend technical presentations. Your message might come across best if presented as an interesting story rather than as a scientific presentation (Snyder & Sturtevant, 2009). For non-technical audiences you should be very careful of specialist jargon and you should explain all acronyms. They also may require additional background explanation to understand the context and your work. Do not simply recycle your slides – slides prepared for a conference might not be appropriate for a public lecture!

4. Planning and preparing the presentation

4.1 Planning

There is a checklist to consider when you plan your presentation:

Checklist	√
Who is organising the event and what are the focus, vision and mandate?	
Have any guidelines been set for my presentation and its content?	
What is the layout of the venue and what infrastructure is available?	
How much time is allocated for the presentation?	
What is the purpose of my presentation – why am I delivering it?	
What should the title be?	
Who am I presenting to and how much does the audience already know about the topic?	
What does the audience hope to gain from my presentation?	
What do I want to achieve with the presentation?	
How much audience interaction do I desire and how will I achieve that?	
What are the main points that I want to make?	
What questions can I anticipate from this audience?	

Gather the information; check the boxes in the list above and go on to sketch an outline of your presentation on paper. Now you can determine the sequence of the slides, decide which media and visual aids you will require and continue to create the presentation.

4.2 Structuring the presentation

A simple structure to work from is:

Introduction

- Welcome the audience (where appropriate).
- Draw the attention and create a positive attitude – for example, use a quote, a provocative statement, humorous anecdote, a picture, a fact or a story.
- Clearly state the purpose of your presentation – what you want your audience to learn.
- The way you open a presentation is probably the most important part – listeners will most likely remember the opening and closing lines of your presentation best.

Main body

- Present parts of the presentation in a logical order.
- Think of your presentation as a story that you are telling your audience.
- Keep the audience's attention and their desire to understand your work and what you are presenting.
- Beware of information overload that can cause the audience to switch off. Be selective with the content or you will find yourself talking non-stop trying to get all your content conveyed.
- Use graphics, pictures or anecdotes to add variety.

Summary/Conclusion

- Summarise key points – these should leave a lasting impression in the mind of the audience that can influence their further behaviour.
- Inspire your audience to act on the information you've given them.
- Thank the audience for listening.

5. Use of media and visual aids

Most people remember through mental images and not words. As the presenter, it is your role to stimulate more than one sense in your audience. Media and visual aids can be excellent resources, and the use of these will be to the benefit of the presentation. However, they should be used to support what you say and should not dominate your presentation. It is therefore very important to select the most suitable medium or combination of aids. People perceive their environment through their senses – tactile (tangible/physical), visual (using sight) and kinaesthetic (activity). Presenters have to take this into account and should vary their aids to stimulate all of the senses if possible, and to accommodate everybody. This means that there could be some activity, as well as visual material and auditory stimuli, depending on the nature and content of the presentation. There are certain constraints, for instance the availability of electricity and a screen/wall, and the size of the audience that should be considered before deciding on the visual aid system to be used.

Here are some examples of media that can be used:

- White board: The board can be used in a very flexible manner. The written text can remain standing throughout the talk and the speaker can build a picture as he/she speaks.
- Flipchart: A flipchart appears to be more creative than does a board; drawings can be taken down, archived, and reused.
- Data projector with computer connection: Presentation software (e.g. PowerPoint) makes direct projection possible. This is a very commonly used medium for presentations. Should you decide to use PowerPoint slides consider the following tips:
  - Slides must look professional and should reinforce what is being said, maintain interest and illustrate concepts that are difficult to explain.
  - Be concise – key words and phrases work well.
  - Plan your presentation carefully and only use slides where they will clarify points. You will communicate better with fewer and simpler slides.
  - Don't try to write too much on each slide. Use bulleted points rather than full sentences.
  - In general don't use more than one slide per minute.
  - Always have an airy layout.
  - Make sure the font is large enough (e.g. Arial 20 or 24) for easy reading.
  - Make sure that you are not standing in the way of any of the audience members.
  - Avoid unnecessary effects – they can distract attention from the content.

  - Never remove your eyes from the audience for more than a few seconds and never turn your back to the audience to read from the screen.
  - Do not use visual aids as trigger notes – they are primarily meant as visual aids for the audience.
  - Use a pointer to emphasise information.
  - Check to see that the slides are easy to read from a distance.
- Demonstrations/experiments/games/scenarios: Such methods are effective but time-consuming and will depend on the event and the size of the audience.
- Video/sound recordings: Make sense as supplements, but the listening time should be kept short.

Often a combination of two or more of the above can be used. When selecting the media and visual aids, the type of presentation and the audience should be kept in mind.

Should you decide to have hand outs for your presentation, remember that the purpose of the hand outs is usually to capture the essence of the presentation, summarise the main points and detail the actions that are expected from the audience. They should be clear, concise and relevant.

6. Delivering your presentation

6.1 Presenting

The main difference between oral and written styles is that when speaking we compose speech instantly – we select our words and construct our sentences according to our immediate thoughts. When writing, we compose our thoughts after considerable reflection – then we rewrite and edit as we continue. Due to this process, written language has a more formal tone, whereas spoken language is more informal, more colloquial. Spoken language consists of shorter, simpler and more familiar words. Another consideration is the technical knowledge of your audience. To effectively translate your presentation to your audience consider the following:

- Focus on clarity.
- Avoid redundancies.
- Use guide phrases.
- Use short, familiar terms.
- Use repetition and restatement.
- Use vivid descriptive words.
- Use strong active verbs.
- Speak on the appropriate level of formality.
- Clarify technical terms.
- Avoid slang.

- Use questions.
- Convey your enthusiasm about your work.
- Create immediacy:
  - personal examples
  - terms that include you and the audience
  - address the audience directly
  - specific names of audience members when appropriate
  - express concern for the audience members
  - reinforce or compliment the audience
  - refer to shared experiences and goals
  - recognise audience feedback and refer to it in your speech
- Be yourself – let your personality emerge and be self-assured and comfortable.
- Avoid making distracting sounds and gestures such as "Ummm" or "Ahhh" between sentences, playing with keys in your pocket or flashing the pointer uncontrollably.
- Practise, practise, practise your presentation. If you deliver a presentation for the first time, it is advisable to practise and test the presentation, using the selected media and visual aids in front of an 'audience' who can give you feedback on areas for improvement before you speak at the real event. Make sure that you will finish within the allocated time. You can also practise in front of a mirror or record your presentation and play it back to yourself. There is no excuse for a lack of preparation.
- Think of the talk as a flight on an aeroplane: Taxi gently, then make a rapid but smooth take off, spend most of the time at cruising altitude, then gently descend and land (Siddons, 2008).

6.2 Dealing with questions

Questions can be intimidating and scary but they are important. Try to be personable in taking questions. Here are some guidelines:

- Repeat the question. This gives you time to think, and the rest of the audience may not have heard the question. Also if you heard the question incorrectly, it presents an opportunity for clarification.
- Make sure that you actually answer the question. Feel free to ask, "Did this answer your question?" at the end of your answer.
- If you don't know the answer, then say "I don't know, I will have to look into that." Don't try to invent an answer.
- If the questioner disagrees with you and it looks like there will be an argument, try and defuse the situation. A good moderator will usually intervene for you, but if not then you will have to handle this yourself. You can for example suggest that you discuss it further after the session during tea/lunch time – always remain professional.

6.3 Developing as a presenter

Being an excellent presenter is not always a natural talent but a skill that many scientists have to develop. There seem to be stages of development that presenters generally go through (Mitchell, 2011). These are:

Stage 1: It's all about the words

In the early days we tend to develop a full script of what we want to say and then try to memorise that. At this stage, connecting with the audience is not as important to the presenter as is the transfer of the script and basically just to get through the presentation still standing. The presenter is therefore primarily concerned about remembering everything he/she wants to say and getting it exactly right.

Stage 2: I can talk

In this stage you often realise that presenting is about more than getting through a sequence of words. As you gain experience and confidence you start trusting yourself to present from notes, and you start to become more conscious of the audience. Still, in this stage the presenter is more concerned about being clear and understandable, and having their presentations 'flow', rather than anything else. To move faster through this stage presenters have to realise that presenting is about sharing ideas and not sentences.

Stage 3: Hello audience

In this stage the presenter is concerned about being interesting and engaging and is therefore more focused on the audience. Know your content well, but focus on expressing your ideas and thoughts to the audience. It can be helpful to make eye contact with individual people in the audience to establish a real connection with the audience. Watch yourself on video and practise connecting with the audience.

Stage 4: It's all about the audience

This is the stage where you realise it's not about you, it's about the audience. In Stage 3 you want the audience to be interested and engaged while in Stage 4, you subsume your needs to those of the audience. You're willing to take risks and make a fool of yourself. In this stage you ask questions of your audience and incorporate audience participation into your presentations.

As you develop your presentation skills remember:

- Learn from role models.
- Criticism is essential to improve your presentation skills.
- Attending and critiquing others' presentations is good practice.
- Attend as many presentations as possible.

The more you speak, the better you will get!

Assignment 5.2

You have to present your research at a conference. The conference is organised by an international organisation that wishes to bring together scientists around the world to facilitate the establishment of networks and collaborative research projects. There will be 150 scientists from a variety of countries and disciplines attending and about 30% will have expertise in your field of study. You will have access to a laptop and data projector in the venue and there will be a roaming microphone. The programme makes provision for 10 minutes presenting time and 5 minutes questioning time for each speaker. Use the guiding information provided in this section to develop a PowerPoint presentation on your research project to present it to the audience described above.

7. Characteristics of a good presentation

The characteristics of a good presentation are:

- proper planning and preparation;
- know your audience and their expectations;
- use appropriate visual aids;
- use hand outs that support the presentation;
- practise enough to ensure that you are confident and relaxed;
- make eye contact and engage the audience;
- have an exciting opening that grabs the attention;
- share your enthusiasm for your work;
- sell your message with a strong summary of conclusions;
- start and finish on time;

- leave time at the end for questions;
- finish in a positive way; and
- have fun!

Remember:

It is about you, your audience, your message and your tools (Eggleston, 2011).

8. Enabling presentations

Presentation skills are one of the many competencies that all researchers should have. If you look at the content of any professional development programme aimed at early career researchers, you will see training on this topic included. This suggests that academic staff in the early stages of their research careers should be encouraged and supported to develop the skill to present their research results and to communicate their research and the importance thereof to a wider audience.

As a research manager involved in the development of early career researchers you will have to take cognisance of the need to foster presentation skills when you construct an early career researcher development programme. This group of researchers has to be trained to plan, develop and deliver presentations and they need to be advised to enable them to develop a personal 'presentation plan' depending on their own experience and skills. In general, early career researchers should be encouraged to present first at internal (department, school, faculty, institution) seminars or events before they move out to present at national and international conferences. When moving out, presenting a poster can offer a valuable learning experience before taking on an oral presentation.

The efforts of an institutional (or school, faculty, departmental) early career researcher development programme can be supplemented by an individual mentor or a small group of mentors who can teach and guide the researchers through personal experience.

Assignment 5.3

You are a research manager in the department/school/faculty/institutional research support office and you have been tasked to develop a professional development plan for your early career researchers. One of the competencies that you will address in this plan is 'Presentation Skills'. Draft an outline for a Presentation Skills Training Workshop and explain how you will go about ensuring that you target the appropriate audience for such a workshop.

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IMPERATIVE

6

GET PUBLISHED

1. Scientific writing

The aim of research is either to add to a scientific discussion or to provide a new perspective – meaning that research needs to enhance our understanding of a particular phenomenon or solve a pressing problem. Scientific writing is inextricably linked to the research process and developing science writing skills is crucial for any researcher.

Research originates with a particular research problem or question (the reason why the research in question is undertaken) which is followed by an in-depth literature review. The literature review should be based on 'literature' (preferably current literature). If literature is dated, the researcher is not able to reflect on the current issues within in a particular field of study. The literature review intends to uncover the knowledge gaps applicable to a particular problem or phenomenon. Through the literature review the researcher acquaints him-/herself with the current discussions, trends, and/or thoughts on a particular topic or phenomenon. The literature review contains reflections and arguments, as well as an indication of the contribution the researcher intends to make to a particular body of knowledge. Through the literature review the current themes, topics and trends pertaining to a particular phenomenon will be systematically documented.

In constructing a literature review, persuasive writing should be applied. This implies the presentation of rational and logical arguments with the aim of persuading the readers regarding a particular point of view. Argumentation is used as a writing tool. An argument is a central idea that is explored and argued with evidence to back it up or to present a particular point of view. Arguments should be logically and purposefully presented, leading

to a step-by-step conclusion that keeps the reader fully engaged in the process. It is further important that the title, problem statement and content of the literature review be continuously integrated with one another.

The title should reflect the problem statement and the content should address both the title and the problem statement. Aligning these aspects is a continuous concern. The reader should at all times know what the author is referring to and assumptions should be avoided, while subject-specific terms and jargon should be clearly explained.

Assignment 6.1

Imagine that you are in a country where matches and their use are unknown. Your company wants to introduce and sell matches in matchboxes in this country. Write a 50-word summary explaining how matches should be used and the precautions that should be taken (see Bungert, 1992).

1.1 The scientific writing process

The scientific writing process is a planned systematic exercise. It is neither a rummaging around of information nor the transferring of information from one locality to another. Through scientific writing an author explores a particular problem, and reflects on how other researchers have addressed the same or similar problems. It implies a process of composition, construction and re-construction. The scientific writing process requires continuous editing on the part of the researcher and no researcher can formulate a treatise, dissertation or scientific paper in only one draft. Each fact provides the 'scaffolding' that enables the gradual construction of the research. The scientific writing process is both recursive (meaning you move backwards and forward between the different writing stages) and iterative (meaning you revisit the stages frequently).

The scientific writing process commences with pre-drafting. Pre-drafting involves preliminary reading and thinking – this is the stage where a prospective researcher should consider a topic of interest. There are various ways in which a topic of interest can be

found. One could become aware of problems that could be researched by simply scanning the environment. Reading is an excellent way of acquainting oneself with the problems and challenges faced by society. It would be advantageous for a researcher to choose a topic that is both intriguing and interesting as this should stimulate the quest for knowledge and finding answers. Having a clear topic in mind from the beginning is not always possible, but clarity will be gained as the research progresses.

Pre-drafting engages the topic and the researcher needs to decide on the focus of the research. During this phase explanatory reading is crucial, as it could assist the researcher in delineating the problem to be investigated. The aims of the study should be aligned with the research problem or question. Once the research problem or question has been identified, it needs refinement and the researcher must reflect on the true extent of the phenomenon to be investigated. Thereafter detailed reading should take place where the researcher starts to formulate the theoretical framework for the research. This involves detailed reading where the applicability of literary sources are assessed and related to the problem under investigation.

Reading should be a critical activity and enough time should be set aside for this. Main arguments should be recorded and refined in constructing the preliminary draft. Pre-drafting is about deciding on the topic, reading, reflecting and engaging in detailed reading in order to come to grips with the latest deliberations and perspectives in a particular field of study. Through the process of detailed reading, main arguments should be determined and incorporated into the initial draft. The initial draft should contain a preliminary introduction, an outline of the arguments and a preliminary conclusion. This stage of the process requires serious consideration as to the applicability of the information and arguments included, and the aims of the study should be aligned with the title and problem statement.

Scientific writing is thus not a simple process, but requires continuous reflection on the part of the researcher that should incorporate continuous revision and editing. This means that the research grows from an initial draft into a presentable piece of science and this is accomplished through the various stages of revision. During the initial revision stages it is crucial that evidence from the various literature sources be incorporated into the arguments. It is also advisable that in-text sources and the bibliography be updated regularly. Coherency and the formulation of arguments should be continuously refined and the researcher should get into the habit of reading and re-reading the text. Reflection and editing elicits insight that will enhance the maturity of ideas and arguments, showing that the researcher has come to grips with the topic and literature. The revision stage also allows for a re-formulation of the study. Often new insights change the focus and even the proposed research problem or question. Once the final focus has been determined, it is essential that the introduction and conclusion reflect this.

1.2 The formulation of arguments

As noted before, scientific writing and argumentation are inextricably linked. In the scientific world there is a pursuit towards knowledge and insight and towards comprehending phenomena in greater and deeper detail. This does not mean that science is only concerned with hard facts, but rather that critical in-depth discussions and reflections on existing knowledge broadens the base of comprehension and a more comprehensive understanding

of existing knowledge is achieved. It is thus a process of continuous persuasion and justification. Through scientific writing argumentation is utilised to inform peers and colleagues of the researcher's insights and suggestions. Argumentation is thus central to science and therefore to scientific writing. Scientific books and articles usually display an argumentative character and this is achieved by demonstrating a particular point of view, opposing existing views and providing reasons why alternative views should be considered.

Argumentation is used to justify claims and consists of presenting the claim and providing reasoned arguments in support of the claim. The arguments should be to the point and reasonable, and based on supporting evidence. There are two types of statements relating to arguments. The first justifies the claim and is known as the conclusion. The statements that are made to justify the conclusion are referred to as the grounds or premises. To distinguish the premise from the conclusion, the claims that are made and the statement that supports the claim should be determined. It is important that all arguments should be followed through and adequately explained and/or motivated, otherwise the reader will not comprehend the arguments. It should never be assumed that the reader knows what is being referred to. With this in mind, arguments could be structured using various patterns. A single conclusion can be inferred from a single premise or a single conclusion can be inferred from two isolated premises. More than one conclusion can be inferred from a single premise or a conclusion can be inferred from two premises. Multiple arguments could mean that one argument serves as a foundation for the next which could in the end constitute a rather complex whole.

2. The challenge to put research in the public domain

Publication is, aside from the increase in knowledge, the aim of all research work. Research should contribute not only to the discourse of the scientific community but also to the addressing of challenges faced by society. Research findings should not only be published in scientific journals, but also in industry journals/magazines and other outlets where interested parties can access the information. A publication in a non-scientific (or popular) journal is still a scientific publication in the sense that it is written by a scientist.

There is a distinct difference between the level of argumentation applied in dissertations and treatises, on the one hand, and the level of argumentation applied in published scientific journals on the other.

On a master's level, students need to show that they comprehend the research process and are able to use applicable methodologies to do independent research.

This is stepped up on a doctoral level where a contribution to the field of study needs to be made.

The argumentation applied to a scientific article should be detailed, reflective and critical. It should further rigorously interrogate research findings and conclusions that add to scientific discourse. It is therefore imperative that a suitable journal be selected for publishing a scientific paper.

The requirements of a journal need to be clearly incorporated into the preparation of the article. Scientific papers are often rejected because they do not adhere to the aims, scope and requirements of a particular journal. Technical and language issues should be carefully attended to as this could enhance the paper's chances of being published.

2.1 Dissertation or treatise

This section provides some guidance on the structure and layout of dissertations and theses. These usually consist of the following:

- Topic and title
- Background of the study
- Problem statement, research problem and/or hypothesis
- Introduction
- Literature review
- Methodology
- Data analysis and interpretation
- Conclusions and recommendations
- Bibliography
- Addenda

2.1.1 Topic and title

The research project usually starts with an interest in a particular topic and the subsequent formulation of a preliminary title. It is important to note that the initial title could change during the course of the study.

2.1.2 Background of the study

The background of the study should provide enough background information for the reader to fully comprehend the necessity of the research. Clear and concise writing is crucial in conveying the particular contribution the researcher intends to make in addressing a particular problem.

2.1.3 Problem statement, research problem and/or hypothesis

The problem statement and/or research questions delineate the scope of the investigation that enables the researcher to articulate the necessity of the investigation. A hypothesis is an educated guess that the researcher will either prove or disprove in the course of the study.

2.1.4 Introduction

The introduction sets the scene and prepares the reader on what to expect. It is crucial that the introduction should be as clear and concise as possible and that the main aims of study are expressed explicitly. The reader should comprehend why the research is important, what has previously been done on the topic and what contribution the researcher is going to make.

2.1.5 Literature review

The literature review is where the researcher engages with the particular sub-topics. Sub-topics can be incorporated either into chapters as in the case of a treatise or dissertation, or they can form part of the headings of a scientific paper. This is the section where literature is being consulted and where the researcher critically engages in argumentation.

2.1.6 Methods

It is crucial that the method of data collection be clearly articulated. Methods of data collection may involve the administering of a questionnaire, interviews and so forth. It is further imperative that the study population and the sampling method be thoroughly explained. The reasons why a particular sampling method has been applied should also be elaborated upon. Non-empirical studies can also have a method and a comprehensive explanation of the methods used should be supplied.

2.1.7 Data analysis and interpretation

Once the actual data gathering has taken place, data analysis can commence. Data may be analysed using either qualitative (descriptive) or quantitative (statistical) methods or a combination of these. Software programmes such as Excel and more advanced statistical packages (e.g. SPSS) can be used to analyse data. If the researcher is unsure of which statistical methods to apply, a statistician should be consulted. The data analysis and interpretation sections are usually characterised by tables and graphs, essentially providing an overview of the respondents' responses.

2.1.8 Conclusions and recommendations

The conclusion section relates the individual researcher's contribution to science. Making a scientific contribution can only be validated if the researcher has applied acceptable and sound research methodologies and argumentation. The conclusion enables the researcher either to add to what has already been done or to provide a new perspective. It is like becoming part of a scientific conversation where an individual researcher adds his/her own voice. Once the conclusions have been finalised, the researcher may be in a position to advance recommendations to deal with a particular phenomenon or solve a problem.

2.1.9 Bibliography

As any research investigation needs to relate and reflect literature it is also crucial to document the sources in a scientific way. Irrespective of the prescribed method, the researcher should carefully and meticulously document sources. It is suggested that the bibliography be continuously updated to ensure that all sources are recorded.

2.1.10 Addenda

Addenda are usually attached at the end of the manuscript and may include maps, cover letters, questionnaires, interview questions, schedules and so forth.

2.2 Technical aspects

Technical aspects are crucial especially in the evaluation of a research project. The following technical aspects should be considered in preparing the final research report:

- All sources quoted or used by the researcher in the course of the research study (especially the literature review) must be acknowledged in the text and in the list of sources.
- Quotations must be used sparingly. If, however, an author has stated a matter as clearly and concisely as possible, one should not hesitate to quote the author. Only the precise words of an author taken verbatim from the source must appear between inverted commas. Where a section is not quoted entirely, but where portions in the middle or at the end are left out, the omission is indicated by three dots. The practice of indicating omissions at the beginning of sentences has fallen into disuse. Any printing errors in a quotation are indicated by the insertion of (sic). Any correction made to the original quotation must be made in text brackets [ ].
- Where a paragraph or section paraphrases an author's view, the author must still be acknowledged in the first sentence of the relevant paragraph or section. The rest of the paragraph or section is automatically attributed to the same source until a new source is acknowledged. The source may be incorporated into the sentence, e.g.: Kotler (1990:50) maintains that … Alternatively the source may be mentioned at the end of a sentence, e.g.: The marketing mix has four components (Kotler, 1990:50).
- Faultless language, good style and correct spelling are prerequisites for the writing of a research report. Bombastic language, superlatives, slang and emotional writing must be avoided.
- Avoid using the first person. An impersonal style should be maintained throughout.
- Avoid long, complicated sentences. Short sentences ensure clear formulation. Avoid difficult learned words, with the exception of technical terms. The simpler one's choice of words, the more easily one can formulate one's thoughts.
- The use of a dash must be limited to the minimum. Use it only if it cannot be left out.
- Numbers smaller than 10 should be written out in the text, except in the case of series, ratios, fractions, or if followed by recognised abbreviated units of measurement, for example, 7 g.
- Series are indicated as 20 to 30 not as 20-30.
- When referring to Chapter 1 or Table 2.1, etc., a capital letter is used because it is the name of the chapter or table.
- Abbreviations should not be the rule. In tables and figures where it is impractical to write out long names, abbreviations can be used on condition that the first time that it is used, the correct name is to be written in full.
- Tenses should be carefully used and applied consistently throughout the text.
- It is advisable to avoid ambiguity when using words such as 'this', 'it' and 'they'. Rather repeat the precise noun or phrase to which reference is made.

Assignment 6.2

Reflect on the scientific writing process and the problems you experience in writing scientifically.

2.3 Publishing in scientific journals

As indicated before, a suitable journal should be selected in which to publish scientific articles. Articles for scientific publications should critically interpret results and conclusions and be characterised by the rigorous application of scientific principles. The following layout usually applies to scientific articles:

- Abstract
- Introduction
- Literature section
- Analysis and presentation of results (if applicable)
- Conclusion
- References

2.3.1 Abstract

The abstract is a succinct summary of a longer piece of academic work. It may be published in isolation from the main text and should relay the essential facts of the full text article. Its purpose is to act as a referencing tool (especially for libraries), and it will direct readers in their decision on whether or not to read the full text article.

2.3.2 Introduction

The introduction provides the background and motivation for addressing a particular topic and informs the reader on the methods and approach followed by the researcher.

2.3.3 Literature section

The literature section critically analyses the literature on a particular topic. This section should reflect the current debates in a particular field of study and should indicate the intended contribution the researcher aims to make. Note that this section must critically engage with literature and not merely present it. The literature section may include headings and/or sub-headings to order the paper in a systematic way.

2.3.4 Analysis and presentation of results (if applicable)

Not all articles have empirical findings to report on. If there are no empirical findings, this section will usually engage the reader in an in-depth discussion and analysis of the issues at hand. If there are empirical findings to reflect on, tables and graphs can be used to present and analyse the results.

2.3.5 Conclusions

The conclusions reflect and interpret the results and draw objective and systematic conclusions based on the analysis of the results. This is the section where new insights are relayed and where a contribution to science is made. This is only possible if the preceding steps have been rigorously and scientifically presented. In a scientific article the analysis of results and the subsequent conclusions should make up 80% of the content – reiterating the fact that critical argumentation is needed on the part of the researcher especially when publication in a scientific journal is considered.

2.3.6 References

References should be presented according to the guidelines prescribed by the journal and these should be thoroughly scrutinised for consistency.

Articles presented to scientific journals should be technically polished and carefully proofread before submission. It is also advisable to use the services of a qualified language practitioner.

Assignment 6.3

1. What challenges are you experiencing in putting your research in the public domain?

2. Reflect on any two articles from a journal in your field of study. Write a short critique on the structure and layout, on the one hand, and the content on the other.

3. List the lessons that you have learned.

4. Compare any of your articles (either published before or in the process of finalisation). How can the lessons learned (above) assist you to improve on your scientific writing?

REFERENCE

Bungert, G. 1992. *Weiter im Text – Schreiben für Werbung, Presse und Öffentlichkeit*. Zürich: OrellFüssli.

IMPERATIVE

7

GO BEYOND ... THE IVORY TOWER

1. Taking research to the next level

Academics might sometimes be regarded as unresponsive to and out of touch with what happens in the real word. They should, however, reach beyond their ivory towers and be active participants in solving societal problems. Knowledge may be viewed as a product of universities that should be imparted to the various stakeholders (students, the scientific community, business and industry, society and local and regional government). Knowledge is a prerequisite for innovation and novel and interesting ways of solving problems or expanding knowledge are only possible if phenomena are clearly understood and a comprehensive body of knowledge is available.

Real innovation cannot occur if the existing knowledge on a topic is not fully comprehended and articulated. Once knowledge has been created, it needs to be transferred to the stakeholders, hence the term 'knowledge transfer'. This is the process of utilising technology, expertise, know-how and facilities for wider application in developing organisations and individuals. It may involve the transfer of expertise from a unit, group or individual to the various stakeholders. Knowledge transfer should ideally result in commercialisation, product and/or process improvement and increased competitiveness. Institutions should support researchers in the early, mid- and established-career phases with the relationship building, contracting, and business planning associated with innovation and knowledge transfer, i.e. the extra knowledge and steps needed to transform a discovery into a product and a product into a viable commercial success.

The stakeholders of a university may be identified as follows:

- Students: They (or their parents) pay tuition fees and invest time to obtain a qualification.
  - Products: Education, skills, qualifications and knowledge.
- Scientific community: The scientific community is comprised of academics, scientists and intellectuals from a variety of disciplines that contribute to the expansion of knowledge and science.
  - Products: Scientific results, new knowledge and publications.
- Business and industry: Business and industry are important partners for universities, and collaboration with business and industry can lead to a better conception of the problems they face. As far as students are concerned, business and industry employ them and they in turn must rely on the formal qualifications and degrees awarded by universities.
  - Products: New products and processes, knowledge transfer, qualified graduates and knowledge.
- Society: Society contributes to university funding either directly (e.g. subsidies) or indirectly (e.g. tax reductions). Administrators (e.g. Departments of Science) give funding to universities and can be viewed as representatives of society (or taxpayers). Society requires qualified graduates to contribute to welfare, innovation and sustainability.
  - Products: Graduates, contribution to the development of society and knowledge.
- Local and regional government: Local and regional government support universities and expect them to contribute to the development and welfare of the region.
  - Products: Education, skills development projects, upliftment of the community and increasing of knowledge.

2. Innovation and knowledge transfer

The processes of innovation and knowledge transfer are connected but not identical. Innovation means creating something new and this may be in the form of a product, idea or process. Knowledge transfer implies the transfer of existing products/processes/concepts to a new locality. In both of these processes knowledge is the essential driver and neither is possible without the existence of comprehensive knowledge.

2.1 Knowledge as a driver for innovation and knowledge transfer

Knowledge is almost universally considered to be a public good and something that should be developed and supported. Knowledge has normative value that extends far beyond a single discipline. It is based on the orderly development of concepts and constructs which is fundamental in developing people and addressing societal needs and challenges. The proliferation of knowledge gave rise to the development of the Knowledge Age that is incessantly fuelled by information. Information enables the configuration of knowledge and once meaning and understanding develop from processing information, knowledge can be generated. In this regard tacit and explicit knowledge can be identified.

Tacit knowledge develops where meaning is constructed from the competencies and experiences of individuals. This may be regarded as the 'know how' that individuals possess and can involve the information, competencies, experience, advice and best practices possessed by employees. Tacit knowledge is unconsciously comprehended and utilised and often difficult to express whereas explicit knowledge is tangible and visible. Tacit knowledge needs to be communicated to become explicit (clear and obvious). This can be done through published reports, manuals, articles, books, magazines and social networks. Explicit knowledge can be regarded as the tip of the ice berg as it represents the knowledge that is easy to find and to share, whereas tacit knowledge is less visible and more difficult to share and articulate.

The availability of information and communication technology (ICT) enables information and knowledge to be captured and disseminated digitally. This includes optical fibres and wireless connections that enable the Internet, cellular technology and other digital devices such as IPads, IPods and the like. The Knowledge Age is characterised by the digital media and no organisation can be competitive without making use of it. The use of management information systems (MIS), decision support systems (DSS), enterprise resource management (ERM), and recently business intelligence systems (BIS) combine data, information, policy and practice into systems that support the processing and presentation of internal and external, explicit and even tacit knowledge. There are three types of knowledge in the organisational context, which vary in sophistication from a basic to an advanced level:

- Core knowledge which is the basic knowledge organisations need to exist.
- Advanced knowledge enables institutions to be visible and to compete with competitors in their respective fields.
- Innovative knowledge differentiates organisations from their competitors and allows institutions to change the rules of the game by introducing cutting edge ideas in striving towards excellence.

Apart from core and advanced knowledge, universities need to have a strong basis of innovative knowledge, as they must create and apply new and existing knowledge. Innovation is only possible if the management of knowledge creates a platform for this to occur. Societal problems are usually diverse and complex and finding solutions seldom falls within the sphere of a single discipline. A variety of inputs from different disciplines are needed to engage comprehensively with societal problems. This necessitates that research should be viewed in the multi-disciplinary, inter-disciplinary and trans-disciplinary (MIT) contexts. Multi-disciplinary research refers to the merging of two or more distinct disciplines that take place at the edges of traditional disciplines and across traditional subject boundaries. It may also refer to the application of research methods from unrelated disciplines or when different disciplines work together, e.g. history and economics. Inter-disciplinary research aims to create close collaboration across disciplines, faculties or units. This includes initiatives that permeate traditional academic departmental boundaries to increase collaboration and cooperation across different disciplines, e.g. Biology and Chemistry that are referred to as bio-chemistry. Trans-disciplinary research is typified by greater horizontal than vertical articulation and by reducing but not completely eliminating

insularity among disciplines, and sometimes by fragmented disciplinary offerings in modules that are more or less strongly insulated along vertically organised subject areas, e.g. research education and environmental studies (see Kokt, Lategan and Orkin, 2012).

MIT research draws academics from their ivory towers to become pro-active and engaged in solving societal problems which will enhance innovation and engagement on the part of the university. This will also support the notion that knowledge has commercial value that can be packaged and sold for commercial purposes. Innovation has tangible advantages for universities that may include patents, new product technology and/or innovative operational and management practices (thus explicit knowledge). There are thus two sides to the coin – the producers of knowledge (universities), on the one side, and the receivers of knowledge on the other.

2.1.1 The producers of knowledge (universities)

Universities are generally responsible for the creation of new knowledge and the dissemination of new and existing knowledge.

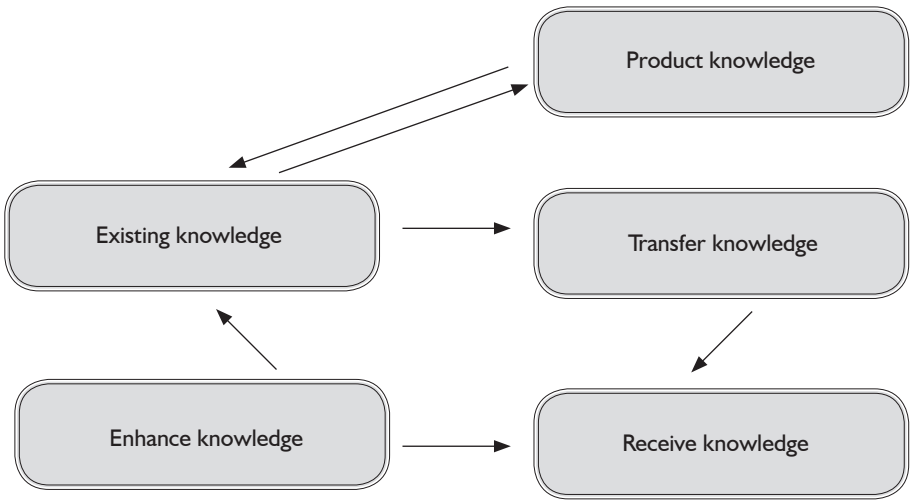

Figure 2: The knowledge production process.

The knowledge production process commences with existing knowledge that is transferred to stakeholders. Existing knowledge should be codified and captured digitally via ICT and disseminated through the social and technological communication infrastructure of the organisation. The social communication infrastructure consists of formal and informal groups and/or the grapevine, and the technical communication infrastructure includes the Internet and other electronic means of communication. The social and technological infrastructure enables organisational knowledge capture which is incorporated into the products, services and processes of the organisation. This enhances and expands existing knowledge that could lead to the development of new knowledge.

Existing knowledge is the catalyst for the development of new knowledge, thus creating a continuous process of knowledge production, utilisation and dissemination. The culture of an organisation should be conducive to knowledge production. Knowledge production requires individuals to be flexible and to be risk takers, tolerant of uncertainty and ambiguity, and to maintain a high level of involvement. If the culture of a university does not embrace these qualities, innovation is not likely to be supported. The culture should also allow a frank appraisal of the knowledge that currently exists, articulating clearly what the university intends to achieve in the future. Innovation is a lengthy process which could imply that the culture of the university needs to change before innovation can become a reality.

2.1.2 The receivers of knowledge

The receivers of the intellectual knowledge could include:

- individuals (any person);
- groups (any set of persons); and
- organisations (any group of persons that has a common goal and a formal structure).

2.2 Methods of knowledge transfer

There are a variety of knowledge transfer methods and they may include:

2.2.1 Education and training programmes

Education and training programmes are an effective way in which knowledge can be transferred to stakeholders. For the knowledge transfer to happen, a supportive infrastructure needs to be created which could consist of adequate marketing and acquisition plans, project administration and management skills, and adequate financial and human resources management.

2.2.2 Publication of research results

See Imperative 6.

2.2.3 The publication of research results is a core activity of a university.

- Research findings can be communicated within the scientific community via scientific journals.
- Research findings can be made available to non-researchers through industry and popular journals.
- Newspapers and books can convey important research findings to the general public.
- Digital and technological media could be used to disseminate knowledge.

2.2.4 Projects where students are exposed to knowledge transfer

Projects can expose students to real-life problems and motivate them to find creative solutions. Internal and/or external partners, including the government, can assist in the process.

The outcome of a project may be twofold:

- Firstly, it could produce a defined set of deliverable items – documents, products and prototypes.
- Secondly, it could also enable the project partner or collaborators to learn within the project and to acquire relevant knowledge and skills.

The advantage of engaging in projects (with governments, public and private companies) is that there are often funding opportunities that can assist the research and by means of which students receive hands-on exposure.

Assignment 7.1

Reflect on the research you have completed and/or are busy with. Indicate any innovative ideas that have emerged from your research and whether they have the potential to be commercialised.

3. Beyond the ivory tower: Making the imperatives work for you

A press release is an effective way to take results out of the ivory tower to the public. Press releases can be sent directly to the local, regional, national or international press. A press release or publication in a general journal is quite different from publishing a paper in a scientific journal. A big advantage is that press releases can increase the impact of your work and the visibility of your project and your team tremendously. As a research manager you should also bear in mind that this can help you to access potential research partners and sponsors.

In preparing press releases, you have to keep in mind that a press release has several target groups:

- The future reader of the paper. This is your most important audience. The AIDA formula well known from presentations also applies here:
  - Attention: A headline that makes the reader take a closer look at the document.

  - Interest: Immediately showing the relevance to the reader.
  - Desire: The intended impact on the reader (e.g. to know more, to use the results).
  - Action: The immediate activity by the reader (e.g. to get in touch with you).

- The editor: Your press release will never be published if the editor thinks that it does not match the policy of the paper or the interest of the target group.
- Your own press officer: He/she will help you, but you must show clearly why the publication of this result at that time in these journals is beneficiary for your university.
- Your peers: They will also critically read the final article (note that this may be an abbreviated version of your press release, omitting the lengthy phrases about the relevance of statistical data).

Ceteris paribus – this also applies to publication on the Internet – either on your university´s homepage, on an edited page run by a newspaper or organisation, on your own homepage or in some social media. The Web 2.0 is changing the world from a producer-oriented (the printer decides what will be published) to a consumer-oriented one (the readers decide what will be read and followed, and what will be ignored).

A press release should be short and concise; 300 to 700 words. Longer texts should only be provided upon request.

Some hints:

- Please be aware that you are (re-)presenting your working group as well as your university and your project partners. You have to bridge the gap between grasping attention and being an exact and reliable scientist (see Imperatives 3 and 6).
- The author (including the contact data) and affiliation (including the contact data of the press office) as well as the date must be included.
- As the text may be abbreviated, the structure will vary greatly from that of a scientific paper which develops a subject: most important statements come first; then towards the end, some details and background information can be added.
- With the result as a central issue, the scientific paper tells the other scientists why this is valid. The press release, on the other hand, tells the readers why this is relevant for them. Hence, press releases to different newspapers also will look different.
- The headline must grab attention. It can be formulated in a provocative way but must reflect the statement of the paper.
- The headline and the statement must be correct. You have to make sure that there is no misinterpretation of statistical data.
- Additional headlines can improve attention-getting and can also help the editor to compile an adequate headline.
- The first sentences will inform the reader and the editor: WHO has achieved WHAT and WHERE, and WHY this is valid and important.
- One message a time. If there are several results, you have to find an adequate general motto.

- Make sure to mention all participants. Especially (local) project partners will be important. You may also add personal statements or cite some of the participants.
- Pictures (two or three) should be added as JPG files. Every picture comes with a title, a description that also shows the relevance to the paper and the full names of all persons depicted.
- Diagrams can be used to visualise results. Pie charts are easily understood, and bar charts can illustrate more complex results. In all cases, keep in mind that the diagrams may be reproduced in one colour. Make sure that diagrams do not lie – either willingly or unwillingly.
- Statements or testimonials by experts, people well known to the public or stakeholders involved in the project can make a text more vivid and authentic.
- Before you send the document, take a break, read it again and have a second person read it. Be careful of lack of, or implicit information, jargon, possible misunderstanding, and formulations that may be interpreted as an accusation or attack on or by anybody.
- Be available for questions from you PR officer and the editors. Depending on the timeline, make sure that you can respond immediately (within an hour), and rather give your (mobile) phone number in addition to an email address.

Assignment 7.2

The press release.

Write a press release about what you would like to read in the newspaper about your project after it has been finalised.

REFERENCE

Kokt, D., Lategan, L.O.K. & Orkin, M. 2012. *Reflecting on Multi-, Inter- and Trans-disciplinary (MIT) research at the Central University, Free State.* Unpublished document: Central University of Technology, Free State.

BIBLIOGRAPHIC NOTES

Dr Karin Dyason is currently the Project Manager: Capacity Development and Professionalisation at the Southern African Research and Innovation Management Association (SARIMA) with the Head Office based in Pretoria, South Africa. She holds a PhD in Electrophysiology from the North-West University in Potchefstroom. She has published 18 articles in international peer-reviewed journals and presented at many international and national conferences. Between 2002 and 2006 she held a Y-category rating from the National Research Foundation. Before joining SARIMA in 2011 she held positions as lecturer, senior lecturer and associate professor at the North-West University. In 2003 she joined the Tshwane University of Technology as the Manager: Research in the Directorate of Research and Development and was later appointed as the Director of Research and Innovation in the Directorate of Research and Innovation.

Prof. Ulrich D. Holzbaur is Professor at Aalen University of Applied Science and Head of the Steinbeis Transfer Centre for Applied Management. He started his academic career at the University of Ulm, with a thesis on the application of mathematical models to optimal decision making. After attaining his doctorate, Holzbaur worked as a software systems engineer and as head of the Airborne Radar Software team in a German avionics company for five years. For six years, he was vice/acting dean of the Faculty of Economics at Aalen University. His current research, lectures and projects comprise mathematical modelling, sustainable development, and quality and project management. He has published various books and articles on mathematics, artificial intelligence and several areas of management.

Prof. Deseré Kokt is Research Professor at the Central University of Technology, Free State (CUT). She holds a doctorate in Human Resources Management and has published more than 20 papers in both peer-reviewed and other journals. She has also delivered 12 papers at national and international conferences and is a Master Human Resources Practitioner (MHRP) with the South African Board for Personnel Practice (SABPP). She is part of the editorial board for the *Journal of New Generation Sciences* (*JNGS*) and the chairperson of the Research Committee for the Faculty of Management Science at the CUT.

Prof. Laetus O.K. Lategan is currently the Dean: Research and Innovation at the Central University of Technology, Free State (CUT). He holds doctorates in Philosophy and Systematic Theology. He has published more than 150 books, monographs, articles, papers, etc. on topics in higher education, philosophy, ethics and research development. He is a rated researcher with the National Research Foundation (NRF) in South Africa. He is the co-editor of a research series on research development and editor of the *Journal for New Generation Sciences* (ISNN: 1684-4998). He also held an extraordinary professorship in research and professional ethics at the University of the Free State.

Understanding what research is all about is a necessary prerequisite for any researcher: This includes the knowledge about knowledge creation and also about the academic environment – a very special biotope. To succeed in the long term, it is important to plan one's own career: Based on planning, aspirations and competencies and on the ability to develop one's skills – including planning skills. Becoming an acknowledged researcher is based on two pillars: On the one hand, one must become a renowned person and on the other, the impact that one makes must become known. This impact is made in three ways: Communication and presentation, written publications and knowledge transfer.

From these objectives, seven imperatives are derived. These imperatives will inform the following discussions:

- Know what research and the research environment is all about
- Personal development and career advancement
- Be a trustworthy person
- Develop your planning skills
- Communicate your results
- Get published
- Go beyond ... the ivory tower

"Research plays an important role in a country's competitiveness, from providing the skilled human resources for participation in the economy to establishing a base of knowledge from which new and innovative solutions can be developed. However, the extent of contribution of research is entirely dependent on its quality and level of excellence. There are a number of key skills required by any researcher to be able to conduct, record, report on and transfer excellent research. This publication divides these into seven imperatives that, together, provide a guide to doing good research as well as being a successful researcher. The publication is focused, in particular, on early career researchers."

~ Dr Michelle Mulder
President: SARIMA (2011-2013)

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