1. **Broad Job Area: Radio Frequency (RF) Engineering**

2. **Examples of Job Titles:**
   - R.F. Designer
   - R.F. Engineer
   - R.F. Architect
   - R.F. System Integrator
   - R.F. Design Engineer

3. **Job Description:**

   **The Vision:** A feature of the global information revolution is the demand for people to be in instant communication anywhere, anytime, on the move, at fixed points. Radio waves are the medium, which provide instant, flexible mobile communications. The R.F. designer has to keep up with fast developing and emerging technologies in order to deliver reliable services at low cost, as this is a fiercely competitive international area of endeavour. The nineties were the era of personal computing; the next decade will be the era of interpersonal computing. The next generation of personal communications devices will be a much more than up graded mobile phones, they will include a palm top computer, a camera, a note book, the Radio Engineer will be at the forefront of these developments.

   **The Role:** The R.F. Engineer is a master of complicated high-tech. testing instruments and powerful simulation tools. The R.F. Engineer specifies, simulates, designs, implements, tests, integrates and/or maintains R.F. sub-systems used mobile phones, base stations and microwave radios. He/she needs to know the system architecture and specifications as well as available components, semiconductor technologies, master R.F. design methods and simulation tools, layout rules and tools as well as testing techniques and instruments.

   **The Lifestyle:** The whole world is moving towards wireless based communications which is unimaginable without RF- Engineering. To be able to keep up with the latest technologies, the R.F. Engineer needs to actively participate in training and other developmental activities. The design of a R.F. sub-system requires both independent and team working. The people the R.F. Engineer most often communicates with are other R.F. Engineers (who are specifying/designing closely related parts of the system), baseband designers (whose design will be interfacing with the R.F. sub-system), project managers and production managers (to ensure manufacturability). Relationships with people ensuring quality are very important for the R.F. Engineer.

4. **Tasks associated with the job:**
   - Participation/monitoring in system/architecture specification in order to understand how the system operates and how the R.F.'s own sub-system (signal input/output)
relates to the whole system.

- Sub-system specification in order to translate the requirements derived from upper level (system specification) into more detailed technical specifications of how the sub-system should function internally to create the required responses (outputs) to certain input signals.
- Integrating R.F. sub-systems into the complete system.
- Material/component selection to ensure that the most suitable (technologically advanced, reliable, compatible and possibly low cost) components are used. Also manufacturability has to be taken into account.
- Simulation of designs with the help of computer models before building physical prototypes.
- Sub-system circuit design: this is often in parallel with the simulation.
- Ensuring that reliability requirements are met in the design: these include E.M.C (electromagnetic compatibility), safety, manufacturability and thermal design aspects.
- Layout design: designing the physical layout of the circuit and components on the printed circuit board or other component base.
- Test specification to define the required test methods, cases and results. This is done by reflecting the original specifications.
- Unit testing: testing the unit according to the test specifications, finding causes for possible failures and solving the problems.
- Participation in design reviews to ensure the design work is proceeding according to agreed processes and quality requirements.
- Participation in the specification and support of engineering processes and tools.

5. **Technology areas associated with the job:**

- Receivers
- Transmitters
- Transceivers
- Power Supply
- Synthesizers
- Oscillators
- Analogue Digital (A/D) converters
- Digital circuit design
- A.S.I.C. (Application Specific Integrated Circuit) technology
- Digital Signal Processors
- Antennas, Digital and Analogue Filters, Amplifiers, Power Amplifiers, Mixers

6. **Type and level of Skills:**

**Behavioural Skills**

- Analytical
• Creative
• Teamwork
• Communication
• Problem Solving
• Flexibility and Self Learning
• Efficiency & Quality
• Business Acumen - Business Awareness

**Technical Skills**

• Technology, Component, Material Knowledge and Thermal Design
• Testing and Reliability Engineering
• R.F.I.C. Design Tools
• Radio Frequency Theory Circuit Design and Methods
• Electronics Theory and Know-How (analogue/digital)
• RFIC, ASIC Design, SoC, Antenna Design
• D.S.P. (Digital Signal Processing)

7. **Description of Career Path/ Future Opportunities:**

The career of a R.F. Engineer would normally start as a designer for small sub-systems. The next step could include tasks in both the specification and design of sub-systems. If choosing the technical expert career path, it could lead to the position of a specialist in a particular domain, which requires building up an extensive knowledge as well as problem solving skills in a certain area. Another possibility would be Radio System Specialist, which in turn requires a wide technological base and holistic view of radio systems. Somewhat less technology development - oriented career moves could be the ones of Project/Team Leader or Technical Account Manager, who are responsible for customer interface.

8. **The type of person this job would suit:**
A creative person with the desire to use leading edge ideas and technology to solve complex problems would like this job. Entry to jobs within this profile requires a Bachelors degree (first cycle degree) in engineering or related technology subjects.

1. Broad Job Area: Digital Design

2. Example of Job Titles:
   - H.W. (Digital) Designer
   - Development Engineer in Digital Baseband Processing
   - Digital Baseband Signal Processing Engineer
   - Digital Logic Designer
   - I.C. Designer
   - Applications Engineer

3. Job Description:

   The Vision: In the next few years the sum of total human knowledge will be digitalized and made accessible via the Internet. Together with the convergence of communications and computing onto common digital components, these will spur the contemporary desire to communicate information anywhere, anytime, faster, cheaper and more reliably. These trends push the frontiers of digital design forward remorselessly. Digital designers conceive information processing architectures, then translate them into circuits and components, which integrate, to deliver the overall aims from processor chips to satellite communications. This is a deep technological role for those who wish to develop careers in one of the key technologies which enables the information age.

   The Role: The Digital Designer specifies, designs, implements and verifies/tests digital circuits used in telecom products, pc’s, audio, video, terminals, network elements and internet related products. She/he simulates integrated circuits and evaluates engineering samples. The major future challenges in digital design are the increasing complexity, the packaging density as well as high speed, low cost and reliability requirements.

   The Lifestyle: Due to the technical complexity, working in teams is essential, usually on an international and multi-site level. This means the Digital Designer needs to play an active role in preparing and mutually exchanging information via up-to-date communication tools like e-mail, telephone and video conferencing. Joint team meetings are held on a regular basis, which involve national and international travel. The Digital Designer has direct contacts with suppliers and customers for training, introduction of technical products and solutions, problem solving and
support purposes.

4. **Tasks associated with the job:**

- Participation in the definition of architectures, translating the digital parts into circuit diagrams as inputs for the design and development of printed circuit boards and integrated circuits. Putting the initial boards into operation and testing them.
- Using these boards for verification and system integration and lower layer test S.W and drivers for S.W. as H.W. platforms.
- Keeping in close contact with designers involved with development of circuits having interfaces with his/her solution.
- Documenting the results of his/her work and creating user documentation.
- Supporting users in the design-in phase starting with training, answering questions and giving technical support.
- Using state of the art measuring and test equipment and support tools.
- Design of signal processing algorithms for implementation in hardware.

5. **Technology areas associated with the job:**

- Board design, system emulators,
- CMOS circuits, mixed signal circuits,
- Microprocessors,
- D.S.Ps (Digital Signal Processors),
- F.P.G.A.s (Field Programmable Gate Array’s),
- P.C.B.s (Printed Circuit Boards),
- Standard integrated circuits, baseband system simulation.

6. **Type and level of Skills:**

**Behavioural Skills**

- Problem Solving
- Analytical
- Creative
- Attention to Detail
- Teamwork
- Communication
- Technical Orientation and Interest
- Professional Attitude
**Technical Skills**

- Digital Design Skills
- Systems Development Tools
- Technology, Component and Material Knowledge
- System Design
- Reliability Engineering
- Testing
- Hardware Knowledge
- Application Design Concepts
- Documentation

7. **Description of Career Path/ Future Opportunities:**

The career path would normally start with the position of Digital Designer, developing to a Digital Design Specialist. Enlarging the technical scope towards neighbouring fields, it can progress to System Architect or with a higher content of organisational and administrative work to Project/Team Leader.

With a stronger focus towards customers and sales, progressing towards Technical Account Manager would be a possible career development.

8. **The type of person this job would suit:**

If you are the kind of person who likes working with the technical equipment in fields of PC, Audio, Video and both writing-up and discussing your results with other team members then you will enjoy this job.

Entry to this job requires a Bachelors (or first cycle degree) degree.

1. **Broad Job Area: Data Communications Engineering**

2. **Examples of Job Titles:**

- Communications Software Development Engineer
- Software Architect
- Software Project Manager
- Network Architect
3. Job Description:

**The Vision:** Access to the Information Age depends on data communications working across all frontiers, technologies and applications. Voracious user demand calls for faster transmission at greater bandwidth with enhanced security, and as this is a competitive market, at lower cost. Voice, moving image and text have all to be handled seamlessly. The Data Communications Engineer has to understand current protocols, network devices and components, software engineering, emerging theory and practice, to work with colleagues to design cost effective technical solutions to exponentially growing traffic requirements. This is a technical career for people who wish to exploit technology to create innovative architectures to support information transmission and management systems. A desire for lifetime learning and technical challenge, and to apply knowledge to create practical solutions, is a prerequisite for people who wish to enter Data Communications as a career.

**The Role:** The Data Communications Engineer specifies, designs, implements, tests, integrates, supports, and maintains switches and network management systems used to implement data communications networks. He/she designs complete networking systems for connecting end terminal equipment such as PCs to Local and Wide Area Networks. The Data Communications Engineer works with customers to determine requirements for equipment and services (such as Mobility, IP Telephony, Video Conferencing, IP Fax, and Security); develops network architectures to satisfy the requirements; simulates and analyses architectural solutions; makes decisions to build or buy the necessary equipment; and designs, develops, tests, and integrates new products to fill gaps in existing product lines. They can be involved in circuit development and debugging, FPGA design and CAD using a range of software tools.
The Lifestyle: The development of a data communications system or product requires very close collaboration with colleagues, but it also requires reliable and timely fulfilment of individual responsibilities. Engineering teams must communicate effectively to develop a common understanding of the product they are implementing and co-ordinate the many individual activities it will take to complete the effort successfully. Individuals must follow through by producing architectures, designs and software that meets requirements on schedule so that the overall effort stays on track. The final stages of a product development effort can be very exciting as many engineers come together to integrate their software and work out the final problems in time for promised deliveries to customers.

4. Tasks associated with the Job:

- Working with customers to determine requirements for equipment and services (such as Mobility, I.P. (internet protocol) Telephony, Video Conferencing, I.P. Fax, and Security).
- Developing network architectures to satisfy the customer's requirements.
- Simulating and analysing architectural solutions.
- Identifying opportunities for development of new internet products.
- Assisting in the specification of suitable hardware architectures as the basis of new products.
- Developing software architectures that are tailored to the proposed hardware platform and which meet customer requirements.
- Deciding whether to build or buy decisions for the necessary software components.
- Designing, developing, testing, and integrating software for the new product.
- Engineering and trouble shooting.

5. Technology areas associated with the Job:

- Embedded processors, hardware architectures,
- transmission media (wired and wireless) and hardware interfaces,
- real-time operating systems,
- I.P.,
- distributed algorithms,
- parallel computing,
- WWW (e.g., http, cgi, browsers, servers),
- UNIX, and network simulation and analysis.
- R.F. backbone architecture.

6. Type and level of Skills:

Behavioural Skills

- Analytical
- Creative
• Teamwork
• Communication
• Professional Attitude
• Problem Solving
• Initiative
• Managing Risks
• Flexibility and Self Learning
• Efficiency & Quality
• Commitment to Excellence
• Customer Orientation

Technical Skills

• Knowledge of Protocols
• Requirements Analysis
• System Architecture
• Software Architecture
• Computer Programming
• Troubleshoot Technical Problems
• Object Oriented Analysis and Design
• System Integration
• Work Estimation and Scheduling
• Ability to understand and evaluate internal/external specifications
• Electronics Theory and Know-how (analogue/digital)

7. Description of Career Path/Future Opportunities:

The Career path usually involves working with designers of the various components or subsystems at a data communications network. Then designing components and in time designing complete networks.

Some people will choose to concentrate on software leading to software design and software architect. Others will develop organisational and management skills leading to Project and Programme management.
8. The type of person this job would suit:

This job requires a creative problem solver capable of working on their own or as part of a team. Opportunities will arise for the kind of person who would like to develop into a project or organisational manager.
A Bachelors degree (first cycle degree) is necessary for this job. Experience in the industry and with ICT customers would also be useful.

1. Broad Job Area: DSP (Digital Signal Processing) Applications Design
2. Examples of Job Titles:
   - Digital H.W. and S.W. Engineer
   - Algorithm Designer
   - Information and Communication Theory Specialist
   - Scientist
   - Applications Engineer
   - Systems Design

3. Job Description:

**The Vision:** Although the world is becoming wired up, it involves many different national, international, regulatory and service provider bodies. Digital Signal Processing Designers have to combine deep technological knowledge - modulation, coding, algorithms with the statutory environment in which they have to operate. This is a deep challenging engineering career for those who wish to specialise in one of the fast moving technologies which underpin worldwide communications. Entry is usually through one of the supporting domains, e.g. algorithm design then progressing to increasing technical complexity and scope across the supporting techniques.

**The Role:** The DSP Applications Designer needs to follow the developments in Standardisation bodies with respect to signal processing. He is involved in requirement studies, simulations and performance analysis and participates in the design and optimisation of algorithms for signal modulation, detection and channel coding/decoding and implementation with signal processors and testing, SW integration and maintenance.

**The Lifestyle:** The technical complexity of the work means a great deal of team work is needed usually on an international and multi-site level within the company and together with customers or competitors. It also involves participating in international committees. This means the DSP
Applications Designer is involved in an active exchange of well-prepared information via modern communication tools like e-mail, telephone and video conferencing. Team meetings are held regularly which involve national and international travel. Due to the importance of algorithms and their strong contribution to the overall system performance, highly innovative work is done constantly.
4. Tasks associated with the Job:

- Being up-to-date with the technical development in this field, monitoring the standardisation work with respect to algorithms and keeping close contact with research in universities.
- Using simulation tools efficiently to check performance and the behaviour of the signals.
- Generating requirements and specifications.
- Designing SW for signal processors and digital filters depending on the application in Assembler or C.
- Coding the SW and implementing it.
- Preparing the system integration and making the testing.
- Delivering new inputs for the specification of new DSP cores.
- Using standard computing HW and SW development tools like configuration management etc.

5. Technology areas associated with the Job:

- Digital Signal Processing (DSP)
- Embedded systems
- Real-time applications
- Wireless communication technology
- System simulation technology

6. Type and level of Skills:

**Behavioural Skills**

- Analytical and Creative
- Attention to Detail
- Teamwork
- Communication
- Problem Solving
- Flexibility and Self Learning
- Commitment to Excellence
- Professional Attitude
- Planning and Organisation
Technical Skills

Comprehensive understanding of the physical layer and specifications of communication systems. Understanding the nature of speech and audio signals and respective codes, systems and standards.

- Digital Design Skills
- System Design
- Hardware Knowledge
- Testing
- System Development Tools
- Applications Design Concepts
- Documentation

7. Description of Career Path/ Future Opportunities:

The career path of the D.S.P. Applications Designer normally starts with the position of a Specialist in a special domain, progressing through positions of increasing technical responsibility such as Algorithm Designer, Signal Path Expert, Core Architect and then Specialist on DSP System Level. With an increasing part of organisational and administrative content it may develop towards Project/Team Leader or Platform Manager. With a stronger focus towards customers a position of Technical Support Manager is possible.

8. The type of person this job would suit.

This job role will suit an individual with a technical and scientific orientation. An ability to relate to customer requirements in the solution of complex problems is also needed. A Bachelors degree (first cycle degree) is needed to start this job.

1. Broad Job Area: Communications Network Design

2. Examples of Job Titles:

- Data (e.g. Internet, private data networks) Network Designer
- Mobile Network Designer
- Hardware Engineer
3. **Job Description:**

*The Vision:* This area is for those who wish to work with clients to help them formulate, then specify and design their communications needs into viable networks. Communications Network Designers need to understand current and emerging technologies and how they can be exploited to satisfy client needs, from wiring up a single site, to a world-wide network supported by different technologies. The role demands that designers know enough about business needs to be able to assist clients to create their communications requirements, then derive technical solutions. Network design is fiercely competitive and fast developing, with client expectations rising all the time; this is a career for those who relish working with clients to develop technological solutions in a challenging commercial environment. Entry usually requires some technical communications experience or a relevant degree.

*The Role:* A Communications Network Designer designs the network using various suppliers' products. The Communications Network Designer will need to analyse and interpret customer needs and then deliver detailed solutions. The needs are usually complex, and teamworking is essential for meeting them. In many cases, this can be with international partners, who may include other telecom companies and suppliers of both equipment and solutions. Competitor threats demand that the solutions delivered are low cost and high quality. It is important that the designer keeps abreast of the latest technologies and understands the commercial drivers for their work.

Some of the solutions that a designer produces are:

- An internet network.
- A mobile network that can offer voice, fax and data services.
- Enhancements to existing networks to take advantage of new technologies, new functionality or capacity extension.
- Networks that enable value-added services, such as multi-media or charge-card services.
- A network that will allow different networks to link (interconnect) and operate together. This could include networks in different countries.
The Lifestyle: Working with a range of suppliers and customers means working closely with others, for example attending meetings to discuss and resolve issues. These meetings will often require the designer to give presentations of proposed designs. The work involves national and international travel, although meetings frequently take place by telephone or videoconference to minimise the cost and time of travel. The designer needs to assimilate and analyse information coming from a variety of sources, including meetings, technical specifications, e-mail and telephone. The designer will be office based working with colleagues, who may be geographically remote, producing the design solutions and using computer programmes to assist in design and modelling.

4. Tasks associated with the Job:

- Working with the customer to analyse their communication requirements and to determine the most cost-effective solution.
- Working closely with suppliers to build an awareness of their products and to give them an awareness of the future products that the designer will need.
- Working with colleagues from sales and marketing to develop the customer relationship and meet the company’s business objectives.
- Responding to customer requirements by giving presentations and preparing formal proposals.
- Providing advice and guidance on the use, operation and design of systems or solutions using specific products.
- Designing, building and running prototypes to test and demonstrate functionality.
- Using computer aided design tools to optimise design efficiency.
- Dimensioning the size of networks to meet the volume/capacity demands of customers.
- Designing, organising and delivering product awareness, skills transfer and product education sessions to other technical specialists in your company and your business partners e.g. suppliers.
- Supporting and working with integration and test engineers so that they understand the design.
- Trouble shooting.
5. **Technology areas associated with the job:**

The Communication Network Designer will perform planning work for the following technologies:

- Mobile networks
- Wireless data networks
- IP (internet protocol) technologies
- S.D.H (Synchronous Digital Hierarchy) & P.D.H.(Plesiochronous Digital Hierarchy) (transmission) technologies
- Microwave radio links
- Switching and intelligent networks
- Backbone architecture
- High bit rate optical transmission systems
- Encryption
- Firewalls

6. **Type and Level of Skills:**

**Behavioural Skills**

- Business Awareness
- Mentoring
- Communication
- Analytical
- Planning and Organisation
- Attention to Detail
- Relationships
- Creative
- Teamwork
- Problem Solving
- Information Handling

**Technical skills**

Many of the technical skills required are developed and enhanced while performing the role. When embarking on this career, companies will be looking for a demonstrable enthusiasm and a fundamental aptitude for engineering in the individual applying for the job i.e. an ability to invent, solve technical problems, logical thought and reasoning, attention to detail.
A foundation and awareness of electronic engineering and/or of software/computing are important. Skills that will be developed and enhanced include:

- Information Flow Analysis
- Network Systems
- Network Modelling
- Network Protocols
- Telecom Technology at Network Element Level
- Cost Modelling
- Statistics
- Design Methods
- Security

7. **Description of Career Path / Future Opportunities:**

There is no pre-defined career path but roles and opportunities include Design Specialist, System Specialist, Project/Programme Manager, and Platform Manager. Sales and marketing, technical consultancy, business strategy - assessing technical capabilities of other companies for potential mergers / acquisitions and to manage the design project and lead the people in the project team.

8. **The type of person this job would suit.**

This job requires a creative problem solver capable of working on their own or as part of a team. Opportunity will exist for the kind of person who may see themselves developing into a project or organisational manager. A Bachelors degree (first cycle degree) is necessary to enter this job.

1. **Broad Job Area: Software & Applications Development**

2. **Examples of Job Titles:**

- Application Programmer
- Software (SW) Engineer
- System Developer
- Technical System designer
- SW Architect
- Maintenance & Support Specialist
- Integration Technician
3. **Job Description:**

**The Vision:** Many of the exciting new IT possibilities rely on software to deliver the product or service. Specifying, creating, testing, installing and maintaining it is now the dominant area of development in bringing new IT systems to the market. Applications Developers are capable of working with colleagues to specify customer's requirements in software terms, then they translate them into efficient, reliable code. Technological expertise in one of the many development environments and application domains (from computer games to electronic payments) is vital, but the ability to understand client requirements is just as important. Programming is one of the best overall grounding for a career in IT. It opens the possibilities of moving into more specialist fields, analysis, design, project/team management. It is a good entry point for development into any or all of these domains. Some companies offer training programmes to graduates of all disciplines to enable them to work in this area.

**The Role:** In this kind of position the SW Applications Developer designs, builds, tests, implements and maintains applications to meet specific customer requirements using existing languages, D.B.M.S. (database management system), development tools etc. They also include the development of methodologies to carry out these activities. The Software Applications Developer understands a range of applications and how to transfer the customers needs into real and robust applications.

Applications developed include enterprise applications, e-commerce applications, management and enterprise information applications, embedded software applications in e.g. mobile phones and Enterprise Resource Planning (E.R.P.) systems in the business and industrial environments. The customer requirements must be understood, as well as the tools to transfer this into a robust application and develop the application in the most effective way. When developing business applications, the developer must gain a thorough understanding of the business processes and constraints. Knowledge of the human computer interaction (HCI) is also part of this role, this involves the human psyche, ergonomics as well as applications development. Examples of applications are: Internet ticket reservations; Corporation Management Information Systems which include all aspects of the business; the technology to transfer graphics or video pictures to a mobile device, and telephone billing systems.

**The Lifestyle:** Although in most cases the work is carried out in teams and in one location, it is also possible that teams work on multiple-sites and communicate via modern media-devices. These teams are often temporary in nature, put together to carry out a particular project. So it is important that people doing this job enjoy working in different teams. In the initial period this job requires a lot of technical tasks with the rest of the team but as time goes on more and more involvement with the business and customer environment is part of the job in order to demonstrate and implement the developed solutions or applications. Also, a lot of interaction is needed with other SW communities (companies, institutes and universities) to stay "up-to-date" with the technology.

Attending conferences and doing extra study courses might require travelling and people working in this area should also cultivate a stimulating "personal network".
4. **Tasks associated with the Job:**

- Applying modern design methods and associated development tools.
- Developing the code and testing algorithms and/or real-time control aspects in a modular way of working that follows the planned structure.
- Analysing system routines/modules, performance, memory size, etc. of (embedded) technical systems (when applicable).
- Supporting project management.
- Building the System and the Sub-systems according to the design and the developed structure and modular set-up.
- Building prototypes of (parts of) the system.
- Co-operating with the Systems Architect and/or System Designer.
- Designing the module test(s), assisting in the design of the integration and installation test. Executing the system integration, integration testing and installation.
- Developing and/or applying a version control procedure, installation procedure and make a full documentation set. Adding relevant documents like release bulletins.
- Executing the technical introduction, the installation, final testing, system.
- Evaluating and arranging the Maintenance & Support.
- Specifying user requirements and functional requirements.
- Drawing up the plan of action for the structural design, the code development and other phases of the Software development cycle.
5. **Technology areas associated with the Job:**

- Operating systems (for e.g. PC, Workstations and Consumer Devices.)
- Programming languages (Assembler, C, JAVA, etc.)
- Embedded Systems (e.g. in Disc-players, TV’s, Game-players)
- Enterprise IT systems (e.g. Enterprise Resource planning)
- Internet applications (like E-commerce)
- Administrative and Financial systems
- Technical systems for machine control and other industrial automation
- Development tools for system and application software
- Database systems for data-exchange with the applications
- Network technology in real-time systems as well as multi-site environments
- Software engineering
- Software components technology
- Enhance and maintain the application

6. **Type and level of Skills**

**Behavioural Skills**

- Analytical
- Technical Orientation and Interest
- Problem Solving
- Attention to detail
- Communication
- Teamwork
- Planning & Organisation

**Technical Skills**

- Computer Programming
- Software Engineering
- Systems Designs
- Testing
- System Development Methods
- Embedded Systems
- System Development tools
- Business Requirements
- Project Management
7. **Description of Career Path/ Future Opportunities:**

With a number of years of experience the role could involve more intensive customer requirements analysis and user interface aspects (become e.g. a full Multimedia Designer/Developer) or extend towards the more scientific side to fulfil computer science roles in e.g. research environments.

A broadening of experience would lead to becoming a project manager/leader with a wider overview. This would be supported by extensive (project) management training. Also in the technical area positions like Systems Developer/Designer and Software-Architect would be future career path development opportunities.

These would also be based on the broader experience from various projects. A wide range of experience in the business is also a way to move into commercial functions in the I.T. area or become a manager and/or an entrepreneur.

8. **The type of person this job would suit:**

A person who enjoys solving technical problems (e.g. Computer programming) would like this job. Someone who can apply modern software design techniques to the solution of problems would also like it. In many parts of the industry a Bachelors degree is required for entry, although there are openings in some companies for people who have taken a shorter course, covering Computer Programming and/or Systems Design.

People who have a Bachelors degree, which includes Computer Programming and/or Systems design, could enter as Technical System Designers, SW Architects and Maintenance and Support Specialists.

Many companies offer positions to suitable candidates with degrees not including computer-related subjects. These jobs include an initial period of training in computer fundamentals and computer programming.

1. **Broad Job Area: Software Architecture and Design**

2. **Examples of Job Titles:**
   - Software Programmer
3. **Job Description:**

**The Vision:** In order to keep up with the dramatic performance advances of hardware, calls for software systems development to keep pace, to enable it to be exploited for commercial benefit. Software Architects conceive the operating software which brings hardware to life, then specify the overall structure which will support sustainable developments on it. These are the foundations of the software technology, which make up software technological solutions. This is a deep technological role, which involves software complexity but also the ability to work as a member of a team. Entry to a career is usually via programming in a specialist, software development environment, though the understanding of basic hardware functions is also important. Career development can lead to increasing technological specialisation in chosen fields and, or team and project management.

**The Role:** A Software (SW) Architect’s main activity is analysis and high-level design. People in these jobs work on software technologies and solutions which are the fundamental blocks on which computer applications and telecommunications networks are built. SW Architects have to track the technical progress of a project to ensure compliance with or enhancement of the existing architecture or design. Depending on their particular role individuals may be called upon to carry out research, analyse, determine the structure (architecture), design, build, test, implement or maintain such software. This is a very technical job, which is basically concerned with programming or program design. However, it requires understanding of both hardware and software because, at this level, the software solutions are influenced by the nature of the hardware (e.g. microchips, computers, telecommunications equipment, individual devices such as a computer controller in a car). Analysis made by SW Architects and Designers would include studying the problem and the aim of the software to be developed as per the specification given by the customer or the marketing department. The analysis would include studying the relevant standards and the hardware documents. Then the SW Architect would aim to develop coherent, concise, accurate and clear to the customer, marketing and other development models. These models would depict the system and its environment e.g. user/software/hardware interactions, in terms of its static and dynamic elements. This requires creativity and the ability to abstract and invent elegantly simple models of complex entities.

It involves interviewing the customer or other sources of the job specification or of system knowledge (e.g. marketing department, potential users), and hardware developers or other subject matter experts who might range from bankers to musicians depending on the job to be done.

In the design aspect of the role the models mentioned above are enhanced to cover the systems constraints such as performance, programming language, operating system etc. For this aspect of the job an engineering mind is needed to develop a solution, which is both scientifically sound.
and meets commercial requirements such as TTM (time to market), Cost, Quality, Re-use. In order to implement, the models designed are specified in a machine executable language and validated for correctness.

The solution designed could be unique to one company or intended to be sold to many different customers. Examples of products worked on in this type of job are:

- Operating systems (e.g. Windows)
- Programming languages (e.g. Java)
- Software controlling specific devices (e.g. minidisc systems or a part of a motor car)
- Telecommunications network controllers

The Lifestyle: Most people in this type of job tend to work in software development laboratories as part of a highly capable team. The size of the team would not only depend on the product, but also the stage of development. For instance, the development of the initial concepts of a product requires much smaller teams than the actual programming stage. More experienced people, who are often recognised experts in a product or technological area, could find themselves visiting customers to make sales calls, give presentations or solve problems; alternatively they might represent their company at large industry events.

4. Tasks associated with the Job:

- Establishing market requirements or enterprise needs.
- Building architecture.
- Developing clear, concise, accurate and coherent models of the requirements.
- Extending analysis models to solve system constraints.
- Designing solutions.
- Designing and testing prototypes.
- Defining detailed specifications.
- Creating maintenance and implementation plans.
- Enhancing products.

5. Technology areas associated with the Job:

- Operating systems (e.g. Windows)
- Programming languages (e.g. Java)
- Embedded systems (e.g. Control functions of a mobile phone)
- Software to control specific devices like a minidisc system or the management of a motor car.
- Database management systems to allow for creation, retrieval and management of large amounts of data (e.g. DB2)
- Systems for controlling large computer systems and networks
- Software to control the operation of games machines (excluding the games)
- Software to enable the use of the internet (e.g. Netscape)
- Application development tools
- Software to control the operation of a telecommunications network

6. **Type and level of Skills:**

**Behavioural Skills**

- Technical Orientation and Interest
- Analytical
- Teamwork
- Communication
- Innovative
- Persuasiveness
- Business Acumen
- Relationships

**Technical Skills**

- Software Engineering
- Systems Design and Architecture
- Computing Systems Design
- Computer Programming
- Mathematics
- Systems Development Methods
- Technical Documentation
- Applications Design Concepts
- Re-use create design patterns/components
7. **Description of Career Path/ Future Opportunities:**

Probably starting as a programmer either developing or enhancing a specific product, the professional can develop into building the design and possibly the architecture of products or even families of products. At this stage the person would be a recognised authority on a particular product within the company and possibly even within the industry.

With some experience in this type of work there are also possibilities of developing a career along other lines such as:

- Understanding how to satisfy customer needs in the market place and developing requirements for new capabilities and products. Experienced people in this field could end up setting overall directions for the development of product families or even a whole industry sector.
- Project Management. This involves managing and controlling a team of developers. For successful individuals the size of projects being managed would increase and could end up directing the activities of a whole development laboratory.

8. **The type of person this job would suit:**

This job would suit a creative person with a desire and the ability to perform highly technical jobs to solve problems and develop software products.

People entering the industry are normally expected to have either:

- University qualifications in SW Engineering or other IT related subjects. These qualifications as a minimum will be at Bachelors level, but many entrants have higher level degrees

- Extensive successful technical experience in other related technical jobs such as computer programming or network design

This job suits people who are primarily interested in highly technical jobs in the IT industry.
1. **Broad Job Area: Multimedia Design**

2. **Examples of Job Titles:**
   - Multimedia Programmer
   - Multimedia Network Designer
   - Web Designer
   - HM Interface Designer
   - Multimedia Architect
   - Internet/Intranet, Audio, Video Engineer
   - Web Information Specialist
   - Web Content Strategist
   - Web Content Programmer
   - Web Producer
   - Web Creative Specialist
   - Web Art Specialist
   - Web Graphic Designer

3. **Job Description:**

   **The Vision:** The continuing rapid development of technology to present information in novel forms is creating vibrant, dynamic, new multimedia enterprises. Most information can now be digitised; text, sound, image (still and moving), touch and presented in exciting, innovative, artistic forms. The Multimedia Designer helps clients comprehend what information can now be created, how it can be accessed, including interactively, then builds and implements software systems to deliver it. As this field is developing rapidly, part of the Designer's role is to explain to clients, facilities and services that they might not have imagined possible, then help them to investigate how they could exploit them for business goals. Multimedia is one of the key growth areas of the next decade and will increasingly embrace entertainment and education, as well as business, as the world gets wired up. We can only surmise how careers will develop, but it will be an exciting growth area combining media knowledge with technical skills. Entry is possible through either media design or software experience and creativity is important.

   **The Role:** Having identified the available medium and proposed a solution, the designer then manages with customers, team members and external agents, the human factors and uses interfaces for visual impact.

   The designer may create prototypes, simulations on virtual environments with various multimedia technologies to represent the proposed system. Alternatively they may re-design or adapt existing products to satisfy the multimedia requirements.
Planning co-ordinating and overseeing acceptance testing, as well as integration and installation at the customers’ site, are all parts of the designer’s role as well as training and customer support.

**The Lifestyle:** Most people in this type of job tend to work in software development laboratories as part of a highly capable team, but this job also offers possibilities of tele-work via network facilities. Multimedia designers are very creative team members who give another vision to the customers’ needs.

A high level of interaction is needed with the customers and the software communities (teams, universities). They must be willing to keep up-to-date on the state-of-the-art in human computer interaction and in audio, video, internet areas (e.g. by attending conferences or working with universities).

4. **Tasks associated with the Job:**

- Analysing enterprise or customer’s needs.
- Identifying, interpreting and evaluating requirements and specific constraints.
- Identifying available media.
- Designing user interfaces.
- Managing - with customers, team members and external agencies- interactive developments and integrating human factors and user interface for visual design.
- Creating prototypes, simulations or virtual environments with various multimedia technologies.
- Redesigning and adapting existing products to fit into multimedia systems.
- Creating or/integrating media elements.
- Producing graphics, animation, audio, tactile, video contents.
- Identifying time and other constraints.
- Integrating, planning and co-ordinating acceptance testing, installation at the customer site with training and support.

5. **Technology areas associated with the job:**

- Human computer interaction technologies (e.g. touch screen)
- Graphics, video, audio technologies
- Specific language for multimedia applications (e.g. HTML, Lingo, Java)
- Specific tools for multimedia applications (e.g. FrontPage, Visual Tools, Illustrator...)
- Operating systems, user interface design conventions and web client design conventions (e.g. Windows 95 style guideline)
- Software to enable the use of internet (e.g. Netscape)
- Email software (e.g. Exchange)
6. **Type and level of Skills:**

*Behavioural Skills*

- Creative
- Analytical
- Relationships
- Communication
- Flexibility and Self Learning
- Technical Orientation and Interest

*Technical Skills*

- Artistic Knowledge
- Software Engineering
- Embedded Systems Knowledge
- Systems Design and Development Methodology
- Applications Design Concepts
- Networking Concept
- End User Interface
- Computer Programming

7. **Description of Career Path/ Future Opportunities:**

To move along the career path a graduate would need a few years of experience and also need a great deal of ability to:

- innovate, to create in a perpetually changing technical environment;
- take a broad view of technologies and to use them in a project, and/or
- willingness to keep up to date technically.

This is a booming area where creativity will always be needed.
The technical aspect of the career path progress might be:

- Multimedia Programmer who is able to develop and implement elements in specific languages (e.g. HTML, Lingo, Java.) and use specific tools (FrontPage, Visual Tools, Illustrator...),
- Multimedia Designer, Multimedia Analyst who is able to gather data to identify various customers requirements, Multimedia Architect who is able to use Software and Hardware technologies (including networks, mainframe and PC client server, internet.) and Multimedia Project Manager. Another step could be to provide technical support for other functions in the enterprise like communication and marketing to open up new market areas. A move into management could be another career development e.g. to become a Design Manager. A move into marketing or communication or training jobs would be yet another possibility.

8. **The type of person this job would suit**

A creative person with graphic and artistic abilities who also have some interest in applying technology will enjoy these jobs.

Most people in this sector of the industry have one of the following backgrounds:

- Artistic studies from universities and art colleges (example: Web Graphic Designer). Entry jobs for this kind of person often include initial technical training.
- A more technical education such as a Bachelors degree or a shorter computer programming course (e.g. multimedia programmer, Inter/Intranet Audio, video engineering)
- Experience of employment in jobs with a creative background such as journalism, television, advertising (e.g. Web Producer, Web Creative Specialist)

1. **Broad Job Area: IT Business Consultancy**

2. **Examples of Job Titles:**

- Enterprise Wide Information Specialist
- e-Commerce Consultant
- Business Analyst
• Business Architect
• Application Specialist
• Information Technology Strategy Consultant
• Strategic Information Management Consultant
• Information Management Consultant

3. **Job Description:**

*The Vision:* The Business Consultant is a person with good overall commercial experience, who helps clients develop I.T. solutions to further their business goals. Knowledge of business context, imperatives and drivers is as important as the potential of I.T. to address them. This is a hybrid role combining business acumen with technological experience. Initial positions are usually through positions in business systems analysis, gaining practice in understanding business processes, whilst learning how technology can be exploited to satisfy business needs. Some companies offer training programmes to graduates of all disciplines to enable them to work in this domain.

*The Role:* The I.T. Business Consultant is responsible for ensuring that business needs are met when developing and implementing I.T. solutions. He/she has understanding of the business strategy and the I.T. solutions required to support it. The person entering this type of job also requires understanding of I.T. industry directions and technologies and demonstrates this in ways which can be used to build the required I.T. solutions. As an example, people in these kind of jobs could be involved with work to understand the implications to the employer’s business of modern e-commerce and internet technologies and then ensure that a solution is implemented to maximise the benefit to the business.

The I.T. Business Consultant is focused on analysing, planning and developing I.T. solutions that support the business needs of the firm. He/she also participates in business planning, business needs analysis and business risk assessment. The I.T. Business Consultant also acts as an in-house consultant working with the various functional areas of an organisation, providing advice and guidance on how to support the business operations through the effective use of I.T.
The Lifestyle: Most people in this type of job work in the information management or application development part of a business organisation. They typically work in teams, in short-term or in longer-term projects providing application development and support services to the business. The work involves a great deal of interaction with various parts of the organisation, negotiating, solving problems, defining and configuring optimum solutions, and communicating these to business managers. In the initial phase of the career, most people in this kind of job have a supporting role in a project, but with increasing experience they get to play the leading role in various projects.

4. Tasks associated with the Job:

- Defining business requirements for the I.T. solution.
- Defining I.T. strategy for the business (which might be, for instance, the best ways to capitalise on the latest internet or mobile phone technologies). Participating in business needs planning & strategy process.
- Identifying and defining opportunities to simplify, improve or redesign business processes using I.T. solutions.
- Analysing, planning, configuring and developing I.T. solutions.
- Overseeing and co-ordinating various aspects of the solution including information flow, data security, business recovery, system implementation, and change management.
- Defining and ensuring implementation of standards and processing across the organisation in support of the solutions.

5. Technology areas associated with the Job:

- e-commerce and internet
- Mobile telephony and networking
- Hardware technology (Computing/Terminals/Middleware)
- Application platforms (e.g. SAP R/3, Lotus Notes/Domino, MS SQL Server, Oracle)
- Modelling (e.g. Business, Data, Process)
- Service Solution building/creation & integration (per application service)
- Service Solution deployment
- Service Delivery (operations/support)
6. **Type and level of Skills:**

   **Behavioural Skills**
   - Flexibility and self learning
   - Creative thought
   - Communication
   - Persuasiveness
   - Teamwork
   - Strategy & Planning

   **Technical Skills**
   - Business Strategy Planning
   - Business Requirements Analysis.
   - Process Improvement and Change Management
   - Systems Design & Architecture
   - Industry Knowledge
   - Systems Development Methods
   - Business Acumen
   - Technology Trends

7. **Description of Career Path / Future Opportunities:**

   The entry position in this career may typically be that of a Business Analyst. More experience with the business and process work leads to positions which focus on developing the business (Business Development Consultant). Some years’ experience in various business related I.T. projects is required for Project Manager’s position. A broadening experience leads to work with I.T. on the strategic level (I.T. Strategy Consultant).
8. The type of person this job would suit:

This is a role for an experienced IT individual. It will suit a person who enjoys solving problems and who has a sharp customer focus and orientation.

A Bachelors and or Masters (first or second cycle degree) would be useful to enter this job role, however, the level and depth of the person’s experience may be a deciding factor.

A person who likes working in a team, and writing and communicating with others with an interest in understanding business and how the business problems of the future will be solved with the help of technology like computers and mobile telephones. A person who thinks solving business problems would be interesting would enjoy this job.

People with third level qualifications in a business related subject (e.g. Accountancy, Business Studies, Economics or a technical subject (e.g. IT, Computer Science, Electronics, Mathematics) should consider this kind. People with more general qualifications in subject areas such as French/German/English, History, Geography... should also consider this kind of job.

A person with full time working experience in general business with a sound understanding of the methods and issues of one or more specific industries or previous IT experience of a more technical nature would also enjoy it.

1. Broad Job Area: Technical Support

2. Examples of Job Titles:

- Computer Operator
- Operations Analyst
- Help Desk Operator
- Disaster Recovery Specialist
- Problem Manager
- Network Management Specialists
- Systems Programmer
- Trouble-shooter
- Configuration Management Specialist
- Product Support Specialist
- Customer Support Engineer
- Support Analyst
3. **Job Description:**

*The Vision:* Just about everyone today in work, and increasingly for leisure and pleasure, relies on accessing information via computers. With increasing complexity of computer systems, build up of inter-connected hardware and software modules, systems sometimes fail. Occasionally it is a genuine systems failure, more often it is user mis-understanding or operational error; whatever the situation is, it has to be resolved and access restored. Technical Support Staff specialise in identifying, analysing and fixing “faults” which prevent users connecting with their systems. As new facilities develop, Technical Support Staff train users in the enhancements and how to maximise their computer system’s potential and usability. Customer handling and good interpersonal skills are as important as technical know how and the desire to investigate and resolve problems. Careers starting in Technical Support can form a sound basis for either enhanced business or technical development. This is a useful entry point for those who wish to enter IT, but have no previous experience.

*The Role:* Depending on their particular role, people in these jobs may be answering customer questions and concerns over the phone, or in person, either resolving the issues with the customer or referring the problem to other technical personnel. They may be responsible for the monitoring and tuning of the computer and telecommunication systems, for installing upgrades, and ensuring the day to day availability of any type of user applications, or computer and telecommunication systems or networks. They may be responsible for the operation of the computers, immediate problem solving and maintaining the service to the agreed levels. In some capacities they may be expected to contribute to user training and make recommendations about system upgrades.

*The Lifestyle:* Most people in this type of job tend to work as part of a Technical Support team. They relate to vendors to assess technical products and to resolve technical issues. They also relate to customers with varying levels of technical skills and understanding. They are often under pressure to manage multiple requests with varying levels of importance and criticality. More experienced people are often recognised as experts in specific products or technology areas, and are called upon by management to give input to technology strategic decisions.

4. **Tasks associated with the Job:**

- Installing, configuring and testing new operating software, software applications and software upgrades
- Evaluating, testing and installing hardware
- Monitoring and maintaining computer systems and networks.
- Document installation and configuration procedures, and maintenance schedule.
- Troubleshooting system and network problems.
- Interacting with users to assess technical problems and needs.
- Interacting with vendors to assess technology products and resolve technical issues.
- Managing system resolution with users.
- Researching technical solution alternatives and implement solutions.
• Operating the computer system and networks.
• Running network applications to support system and users.
• Answering, or forwarding to appropriate personnel, user questions and feedback.
• Documenting user issues and making recommendations for user training.
• Making recommendations for system improvement.
• Taking part in technical reviews, staff meetings and perform appropriate communication functions
• Supporting new applications
• Working in laboratories simulating customer networks
• Prioritising and managing several open cases at one time

5. **Technology areas associated with the Job:**

- Workstations operating systems
- Mainframe systems
- Mainframe operating systems
- Network systems
- Network operating systems
- Internet software (Application downloads)
- Office software applications
- E-mail software
- Troubleshooting software
- System peripherals
- Telecommunication networks

6. **Type and level of Skills:**

**Behavioural Skills**

- Communication
- Strong Customer Focus
- Social Skills e.g. to deal well with customer complaints
- Problem Solving
- Flexibility and Self Learning
- Technical Orientation and Interest
- Attention to Details
- Analytical
- Initiative
- Pro-active
- Organisational

**Technical Skills**

- Troubleshoot Technical Problems
- System Design Architectures
7. Description of Career Path/Future Opportunities:

Many Technical Support personnel start in technical call centres, answering user questions or referring them to more specialised technical departments. As more experienced is gained they may move to specialised help desk areas where they deal with more complex technical questions. As they continue to gain experience, they become more closely involved with the system, installing, configuring and troubleshooting hardware and software: starting with user applications and progressively moving towards system operations. As they gain expertise, they are involved with more of the planning and optimising of the system. With further education, they may choose to move towards careers such as network design and implementation specialists.

As the Technical Support person develops expertise and a professional network of business contacts, some will choose to become consultants. Many consultants tend to specialise in one or two vendor systems and will often obtain certifications from these vendors to increase their demand in the computer Technical Support market and also in order to meet customer and quality requirements.

Some people with Technical Support background may choose to migrate in the area of user training.

8. The type of person this job would suit:

A person who is fascinated by how technology works and likes helping people to fix problems with technology systems will enjoy this job. Technical support roles suit people who enjoy the challenge of supporting customers who may be unclear about the problem they actually have and require immediate support.

There is a great deal of flexibility over the entry requirements into these type of jobs. In general, educational level will determine at which level an individual can enter this job area. Once in this kind of job, progression to higher levels and different types of jobs will depend very much on ability and performance.

A person with school leaving qualifications could begin work as a trainee computer operator, helpdesk operator or trouble-shooter. To perform some of the other jobs within this profile such as Network & Configuration Management Specialists and Operations Analysts a person will need to continually update his/her technical knowledge and experience, on the job and by taking
appropriate courses and getting more advanced qualifications as necessary.

Alternatively, a bachelors degree could be a pre-requisite for jobs such as Systems Programmer.

1. Broad Job Area: Product Design

2. Examples of Job Titles:
   - Design Engineer
   - HW Design Engineer
   - HW Development Engineer
   - Product Development
   - Computer Support Specialist
   - Computer Designer
   - System Integrator
   - Logic Design Engineer
   - Physical Design Engineer
   - Design Rule Engineer
   - Analogue Circuit Designer

3. Job Description:

The Vision: The power and functionality of contemporary hardware and software means that I.T. products are becoming increasingly sophisticated and complex. The Product Designer works with colleagues to specify, design and build new artefacts which range from next generation hand held personal information appliances, to next generation computers. In some cases the work is carried out in a research or experimental environment. Team working and the ability to model and simulate novel situations are important. This is a deep technological role involving microelectronics for those engineers who wish a career at the forefront of technology, to exploit it for novel product development.

The Role: The Product Design Engineer often uses highly sophisticated computer based simulation systems to prototype new hardware devices and may also be involved in the design of software to enable the simulation or to enable the hardware devices to work in a complete system. Programming at this level requires a much deeper understanding of the architecture of electronic devices than say an Applications and Software Developer who would concentrate more on implementing business processes or user interaction. This job role requires knowledge of microelectronics.
The Lifestyle: The Product Design Engineer has a collegial responsibility as a member of a group. The Product Design Engineer is responsible for the quality of his/her own work. Since the Product Design Engineer work is highly technical contact with customers is not so frequent at the beginning of the career.
4. **Tasks associated with the Job:**
   - The work includes planning of hardware, both prototypes and specific parts. Further on, the work also includes design and testing of subsystems and prototypes.
   - A Product Design Engineer is as a member of a group responsible for testing and integration of new products.
   - The work requires good knowledge of how to select the proper materials and components.
   - Identification of model performance requirements and specific constraints is also an important task in product design.
   - As a new Product Design Engineer it is very important to continuously train and build-up the required expertise.

5. **Technology areas associated with the Job:**
   - Analogue/digital circuit design,
   - Signal processing,
   - High frequency planning,
   - Analogue/digital electronics

6. **Type and level of Skills:**

   **Behavioural Skills:**
   - Analytical and Creative
   - Teamwork
   - Flexibility & Self Learning
   - Commitment to Excellence
   - Communication
   - Problem Solving
   - Decision Making
   - Professional Attitude

   **Technical Skills:**
   - Electronics Theory and Know-how (analogue / digital)
   - Digital Design Skills
   - Hardware Development Process
   - Production Technology
   - Knowledge of Quality standards
   - Systems Development Tools
   - Solid State Technology
• Knowledge of Physics
• Knowledge of Mechanical Engineering

7. Description of Career Path/Future Opportunities:

A Product Design Engineer has many career opportunities. One of the opportunities is to work in the highly technical field as a theorist, researcher or inventor. The work is often done in multi-disciplinary project teams. In Product Design there is also the opportunity to advance into a managerial or project leadership position. Many Product Design Engineers decide later in their careers to be independent consultants or even start their own consulting firms.

8. The type of person this job would suit:

People who look logically at a technical problem to find a solution, can form relationships to support and plan the way a team will work to solve a problem will enjoy this job.

To enter as a technician a two-year course covering testing, systems design and architecture and computing system design fundamentals would be needed.

All other jobs such as Systems Implementation Engineers and Test Specialists would need a Bachelors degree or more (i.e. first cycle or second cycle degree).

1. Broad Job Area: Integration & Test/Implementation & Test Engineering

2. Examples of Job Titles:

• Systems Integrator
• System Implementation Engineer
• Integration System Engineer
• Integration Engineer
• Implementation and Test Specialist
• Integration and Test Specialist

3. Job Description:

_The Vision:_ We are all embarking on an information revolution, driven by the convergence of computing and communications technologies onto common components; the international
telephone network is the largest, most complex artefact, ever devised by man. Telecommunications are a key component, developing at unprecedented rates; testing existing and emerging technologies to ensure fitness for purpose are vital tasks. The Integration and Test/Implementation and Test Engineer is a pivotal figure in these developments and has opportunities to specialise in both telecom equipment and testing techniques.

**The Role:** The Integration Engineer needs to work very closely with the design and development teams to ensure that they have a good understanding of the product or system that is being created. Throughout integration and test, a close relationship will be maintained with the designers/developers or suppliers of the various component parts as the Integration Engineer will need to ensure that changes are made in the various components that will allow them to work together as intended. The Integration Engineer will also need to understand the customer requirements as part of the role is to design a set of test scenarios to check that the product /system meets these requirements.

The Implementation Engineer fulfils a similar role, but, whereas the Integration Engineer proves the system works as intended at the end of its product development, the Implementation Engineer ensures that it functions at the operational site through its installation and commissioning. There is also the need to provide support while the people who will be ultimately responsible for operating the product / system learn about it. This means that the Implementation Engineer will be responsible for undertaking the hands-on-training of these people and may be responsible for managing the training programme of the operational staff.
Examples of products or systems for integration and test / implementation and test include:

- A new telecom billing system into an existing telecom network, which will include systems that manage the operation of the network and systems that are used to take customer orders.
- A new platform to provide telemarketing services
- A new platform to provide multi-media services
- A new platform to provide Internet services
- A new platform to provide mobile telephony

The Lifestyle: People work in highly capable teams and initially the job requires a number of technical tasks with the rest of the team and the design and development teams. There is then increasing involvement with the customer as a major part of the work is to implement the solution in the customer’s environment to ensure that the product / system provides what is required by the customer.

4. Tasks associated with the Job:

- Organising, managing and executing integration on the development and operational sites.
- Organising, managing and executing migration tests on the development and operational sites.
- Configuring the product / system to meet customer needs.
- Designing and running representative performance tests to prove capability.
- Estimating the amount of work required of the integration / implementation team.
- Co-ordinating the actions of the different specialists participating in the project.
- Assuring that the product / system functions as defined.
- Participating to transfer knowledge to the production process.
- Participating in training the customer.
- Specifying the end-to-end tools for system integration.
5. Technology areas associated with Job:

- Operating systems
- Skills relevant to the business area where the system is being deployed e.g. in telecommunications he/she will need to have an understanding of telecom standards and networks.
- Database management systems (e.g. Oracle)
- Network Protocols and Internet Protocols (e.g. HTTP, INUP, INAP, ISUP, X25, C7, TCP/IP)
- Test tools and methods
- System engineering methodology and tools

6. Type and level of Skills:

Behavioural Skills

- Ability to successfully manage relationships with customers, suppliers and colleagues
- Analytical
- Creative
- Attention to Detail
- Teamwork
- Communication
- Problem Solving
- Information Handling
- Initiative
- Delivering to Deadlines
- Planning and Organisation
- Leadership
- Flexibility and Self Learning
- Commercial Awareness
- Commitment to Excellence
**Technical skills**

There is not a requirement to have all of the following skills, as some will be developed in the role. Skill requirements will also depend on the type on the work/business area involved.

- Basic Electronics Theory and Know-how (analogue / digital)
- Basic Hardware Knowledge
- Basic Software and Embedded Systems Knowledge
- Computing System Design Fundamentals
- Electrical and Physical Effects
- Evaluation of Hardware Requirements
- Knowledge of configuration methodologies
- Hardware Development Processes
- Integration Concepts
- Knowledge of Product Creation Cycle
- Reliability Engineering
- Performance Engineering
- System Design System Management Concepts
- Testing
- Knowledge of Verification Types
- Application Design Concepts
- Software Development.
- Computer Programming
- Knowledge of change management

7. **Description of Career Path/ Future Opportunities:**

Often people aim to become an Integration Specialist because of their like to see a total product coming together. Other roles and opportunities include Integration Engineer, Team Leader, Project Manager, Technical Consultancy, Sales and Marketing.

8. **The type of person this job would suit:**

A creative person who has a holistic approach to the solution of problems, is able to get on well with others to lead and to manage a team will enjoy this job.

1. A first cycle degree is a minimum entry requirement of this type of job.
1. **Broad Job Area: Systems Specialist**

2. **Examples of Job Titles:**

   - Product Specialist or Consultant
   - Systems Engineer
   - IT Specialist
   - Customer Systems Specialist
   - Solution Specialist
   - Technical Designer
   - Key Account Manager

3. **Job Description:**

   **The Vision:** Clients' commercial information needs change quickly, as business develops to respond to competition and new markets. The Systems Specialist works with customers to enhance their systems, to support emerging business requirements. Often specifications are worked up in competition against other suppliers. Systems Specialists have to be aware of how to exploit hardware and software in a cost effective manner to satisfy customer requirements. There is a need to inform potential clients of new facilities that technology affords, to develop novel products and services which could expand their operations. This is a hybrid role, knowledge of the business context and how to deal with customers is as important as technical know-how. Career development can follow either an increasing business oriented route to helping set IT strategy, or deeper into the hardware and software as a technological specialist. Some companies offer training programmes to graduates of all disciplines to enable them to work in this domain.

   **The Role:** The Systems Specialist designs computer system solutions for customers from existing hardware and software products. The solution is designed to meet the customers requirements and since often the customer is seeking proposals from more than one supplier the Systems Specialist needs to ensure the design is cost effective and produced to tight time scales.

   Computer systems often comprise many diverse products such as processors, networks, system software and application software. The Systems Specialist will be a recognised expert in a subset of these products and will often work in a team with experts in other areas to produce a complete IT solution for a customer. For complex projects this team may be technically led by an IT Architect or Systems Integration Specialist. The Systems Specialist will often use tools and methodologies to manage and design these solutions to help insure a quality design.

   **The Lifestyle:** By meeting with customers and seeking to understand their requirements the Systems Specialist will often learn much about how different industries and customers operate.
As an expert the Systems Specialist is often called upon to educate others via presentations and workshops. Maintaining these high levels of expertise requires frequent self study, training and reading of computing magazines.

4. **Tasks associated with the job:**

- **Analysing the customers’ IT requirements to determine the best product selection and configuration.** The best solution will be based on providing the required features and performance at an acceptable cost and available to meet the customers time scales.

  *Task Example:*
  A Public Sector Organisation has written an operational requirement (O.R.) document (sometimes comprising 100+ pages) which defines the function, features, performance and other requirements of a new computer system to run a Human Resources application. The S.S. reads the O.R., clarifies uncertainties with the customer and then determines what size and configuration system meets the requirements at lowest cost.

- **Responding to customer requirements by giving presentations and preparing formal proposals.**

  *Task Example:*
  A Retail customer needs to put in place a new network linking all its branches, offices and warehouses. The S.S. will assess the requirement, prepare a presentation and then present to the customer’s decision making team the proposed solution in terms of technology and products. The presentation will also demonstrate why the proposed solution is better than competitive solutions. The S.S. will also produce a document which details the technical aspects of the proposed solution. The ability to effectively manage the network is likely to be key and the S.S. will need to understand the types of problems that may occur and how management tools can be used to detect, report and manage these problems.

- **Providing advice and guidance on the use, operation and design of systems or solutions using specific products.** This could be by writing papers or reports, answering questions or demonstrating how a program works.

  *Task Example:*
  A Bank wishes to analyse its customer data graphically to more easily spot patterns in the data. The S.S. designs and implements a proof of concept demonstration to convince the customer that the proposed products solve this problem. During the demonstration the S.S. explains how the various features of the solution are used. If high availability is a requirement the S.S. will need to consider the appropriateness of different techniques (RAID, Mirroring, Data Replication, hot standby etc.) and recommend the best solution.
• Designing and running benchmarks to prove systems capability. A benchmark is a measure of system performance at a given, repeatable workload.

Task Example:
A University is developing a numerically intensive program for analysing fluid turbulence. The program takes weeks to run and the customer requires a system that delivers answers in hours. The S.S. determines the feasibility of running this program in parallel on many computers at once, he engages a programmer to make changes to allow this to happen and then designs a series of tests that can be run to show how performance improves as processor power and the number of processors increases. He then runs the tests to determine the optimum system configuration.

• Using sizing and designing tools to determine appropriate product configurations.

Task Example:
An Insurance company wants to start trading on the Internet. Your company is proposing an e-commerce solution. The S.S. uses a purpose designed sizing tool to capture information about the number of concurrent users, transaction size and complexity, and data volumes to profile the expected workload. Based on the output from this tool and the S.S.’s experience he is able to design a suitably sized configuration.

• Planning, configuring, customising, and tuning these products for customers.

Task Example:
A Manufacturing customer has purchased a pilot stock control system from your company and requires assistance in deciding the optimal physical database design and configuring the database to ensure good performance. The S.S. performs this work and uses performance monitoring tools to determine if any configuration parameters need changing or new index’s need to be created.

• Designing, organising and delivering product awareness, skills transfer and product education sessions to other technical specialists in your company and your business partners.

Task Example:
As an S.S. working for a manufacturer or software vendor you will ensure that those companies that resell your product are kept up to date with product changes and have the necessary technical expertise to efficiently sell your products.
- Working with Sales Specialists to assist in meeting your own companies’ business objectives.

**Task Example:**
Your salesmen will have specific quota and time scale requirements. In determining the best technical solution the S.S. needs to balance the customers requirements with his business’s sales requirements to ensure his business continues to be successful and can continue to service customers. The S.S. will meet regularly with his Salesmen and will probably call together on the customer.

- Working with Integration and Implementation Specialists and software and Application Developers to appropriately size work efforts.

**Task Example:**
Many customer requirements cannot be met from standard products. If the bespoke development activity is large then the opportunity will probably be led by a Software and Application Developer or Integration and Implementation Specialist. If it is small then the S.S. will meet with these specialists to design and scope the development activity

- Working with Project Managers to derive appropriate time scales and costs.

**Task Example:**
Project Managers need input from S.S.s to determine the resources, size and time scales of any major proof of concept, benchmark, bid implementation integration or development activity

5. **Technology areas associated with the job:**
The Systems Specialist will have an in depth understanding of products, offerings and services within their speciality. Some of the major specialities are:

- Commercial computer systems e.g. UNIX, or NT based
- Parallel High Performance computers e.g. Cray Super Computers
- Technical Workstations e.g. graphical visualisation
- Sub-systems such as disk, processors, memory, i/o adapters
- Local Area Networking e.g. routers bridges, and protocols such as Transmission Control Protocol (TCP)/ Internet Protocol (IP)
- Wide Area Networking e.g. X25, packet switched networks
- Operating Systems e.g. NT, UNIX
- Databases e.g. RDBMS (e.g. Oracle), Hierarchical
- Middleware such as message queuing and transaction processing
- Internet application enablers such as web servers, fire walls
- Applications such as Human Resources, Manufacturing Planning, Decision Support,
6. **Type and Level of Skills:**

*Behavioural Skills*

- Analytical
- Creative
- Flexibility and Self Learning
- Leadership
- Commitment to Excellence
- Communication
- Teamwork
- Relationships
- Planning and Organisation
- Technical Orientation and Interest
- Persuasiveness
- Mentoring
- Business acumen

*Technical Skills*

- Computing System Design
- Computer Systems
- Systems Management Concepts
- Database Concepts
- Networking Concept
- Systems Design
- Integration Concepts
- Applications Design Concepts
- Hardware Knowledge
- Software Engineering
- Mathematics
- Statistical Analysis
7. **Description of Career Paths / Future Opportunities:**

As a young Systems Specialist the world of IT is at your feet. It is one of the most varied and exciting roles within IT and enables a wealth of career opportunities depending on your personal mix of technology interests, business interests and personal skills.

If the lure of technology as an end in itself is your goal, moving into Systems Integration and Implementation or Software Development is a well established option. If using IT to solve business problems is more exciting then Consultancy, Business Analysis, or Project Management will appeal. If your vision is more global and you are keen to direct product development or identify new markets then your Systems Specialist training and experience will be extremely valuable in Product Management and Marketing. Lastly some Systems Specialist's find the excitement of winning a major order gives them such a buzz that there is no alternative but Sales - and having a good understanding of the product you are selling is a great help.

8. **The type of person this job would suit:**

This job will suit people who have ambitions in either the purely scientific side of the industry, or those who would prefer to hone their technical skills before moving into business or organisational management. Either way you will need to be creative, able to solve problems of a complex nature, work on your own, but more often as a part of a team.

A first cycle degree is a necessary entry qualification for this job.

1. **Broad Job Area: ICT Marketing Management**

2. **Examples of Job Titles:**
   - Product Manager
   - Services Marketing Manager
   - Communications Product Manager
   - Software Product Manager
   - e-Commerce Product Manager
   - Pricing Analyst

3. **Job Description:**
**The Vision:** A fundamental part in the ICT Industry is to detect what it is that customers and the market needs, and to translate these requirements into services and products which answer these customers’ needs, while providing benefits to the company at the same time. Whether the product is hardware or software, the ICT Marketing Manager is a very important part of an ICT firm. The ICT Marketing Manager has responsibility for every aspect of a particular product or family of products from development to release, to the market place, combining business and technical aspects of the products.

**The Role:** An ICT Marketing Manager controls the life cycle of a product or family of products, executing many activities related to it, from bringing a new product to the market, to managing it, in collaboration with external providers, subcontractors, other company’s experts in Engineering, and Sales for example.

**The Lifestyle:** Often, marketing managers or product managers are part of a bigger marketing team, where they co-ordinate the external promotion of the product with the sales force e.g. via advertising, mail shots, seminars and other events. They are usually the ones responsible for the revenues from the product they manage. If the product achieves its revenue objectives then the Marketing or Product Managers will often be rewarded by a bonus. Successful marketing managers spend a significant time building relationships and influencing senior business managers and customers as well as senior designers and architects for their products. They spend a lot of time in workshops, conferences, etc, sharing their ideas with others. They also spend a lot of time with customers to define jointly product plans and roadmaps for ICT marketing.
4. **Tasks Associated with the Job:**

- Determines customer’s needs and wants
- Product pricing by specifying the research needed to obtain market information
- Makes recommendations on the nature and scope of present and future product lines by appraising new product ideas and
- Makes recommendations on product or packaging changes.
- Assesses market competition by comparing the company’s product to competitors’ products.
- Provides source data for product line communications by defining product marketing communication objectives
- Obtaining and building product market share by working with sales director to develop product sales strategies
- Assesses product market data by calling in to meet customers with his/her sales people in the field and by evaluating sales call results.
- Provides information for management by preparing short-term and long-term products sales forecasts and special reports and analyses;
- Answers marketing related queries
- Facilitates inventory turnover and product availability by reviewing and adjusting inventory levels and production schedules.
- Brings new products to market by analysing proposed product development programmes; preparing return-on-investment analyses; establishing time schedules with engineering and manufacturing.
- Introduces and markets new products by developing time-integration plans with sales, advertising and production
- Determines products pricing by using market research data; reviewing production and sales costs; anticipating volume; costing special and customised orders
- Completes operational requirements by scheduling and assigning employees; following up on work results
- Maintains professional and technical knowledge by attending educational workshops; reviewing professional publications; establishing personal networks; participating in professional societies.

5. **Technology Areas Associated with the job:**

- All technology areas, which relate to the ICT products and services are associated with the job.
6. Type and Level of Skills:

**Behavioural Skills**

- Communication
- Creative
- Business acumen
- Customer Orientation
- Flexibility and Self Learning
- Initiative
- Strategy and Planning
- Relationships
- Commitment to Excellence

**Technical Skills**

- Marketing Mix (Product, Price, Place, and Promotion)
- Business Strategy Planning
- Project Management
- Commercial vision
- Integration concepts
- Technology trends
- Technology product knowledge (depending on the area of the market they work, hardware, software, communications …)

7. Description of Career-Path / Future Opportunities:

The career path would normally start as a trainee Product Manager, or start as a cross profile, with professionals coming from more technical areas (Engineering, etc), with a technical background. When they are consolidated Product Managers, their career could develop to Project Manager, Marketing Manager, or to more customer-oriented areas, such as Sales, Pre-Sales, IT Consultancy, etc.
8. **The type of person this job would suit:**

This job would suit a person who enjoys combining ‘technical work’ with market orientation or business awareness to his/her job. The job requires and enables the person working it to develop a global vision which encompasses the whole firm in which she/he works.

A person who likes working in a team, as well as writing and communicating with others with an interest in understanding how business works and in business strategies, would be good at this job. A person who is concerned with how the business problems of the future will be solved with the help of technology like computers and mobile telephones would be interested in and would enjoy this job.

A business or marketing bachelors degree (first cycle degree) would be the usual entry requirement for this type of job. Experience in marketing would also be an advantage. A person with a technical background and a Masters in Marketing or an MBA (Masters in Business Administration) would also have the necessary qualifications. The level and depth of a person’s technical knowledge, business awareness and experience would be the decisive factors for entry to this job.

1. **Broad job Area: ICT Project Management**

2. **Examples of Job Titles:**
   - Product Planner
   - Master Scheduler

3. **Job Description:**

   **The Vision:** The ICT industry finds itself in a highly competitive environment that has to be able to give effective answers to clients, the ability to innovate and adapt to change can determine business success. The Project Manager is a fundamental part of this because his/her role is to detect and translate the clients’ needs into concrete projects that offer advantages that lead to a competitive edge over the competition.

   **The Role:** The Project Manager has a fundamental role in the design, development and results of his/her projects. His/her function is as much creative as that of an integrator. The project manager offers client solutions therefore she/he offers creativity as an answer to the clients’ needs. To solve the clients’ demands he forms a group of specialists, which she/he directs, and
co-ordinates as well as integrating her/his ideas into a definite solution.

**The Lifestyle:** The competitive environment that we move in means there are many business demands that are handled by means of projects. The characteristics and size of these projects mean that often the teams are made up of a great variety of people from different areas, with different languages and varied professional backgrounds. The Project Manager has to co-ordinate and direct these diverse groups, which means he/she needs great flexibility and an open mind. Linked to initiative, energy, and the ability to empathise with members of the team so as to take full advantage of their potential and integrate all their possible contributions into the projects.
4. **Task associated with the job:**

- Organise, time and resources available in order to comply with time frames and quality standards.
- Co-ordinate and prioritise activities and establish critical points in the design and development of the projects to obtain excellent results.
- Direct and manage projects.
- Implement on going assessment and evaluation models for the projects he/she directs or is involved in, trouble shooting and implementing the necessary improvements to guarantee successful results.
- Apply consulting methods adapted to the circumstances in which the projects develop.
- Analyse client needs, means and the timeframes, that are available and the conditioners that could exist in order to offer the most beneficial solution for the client.
- Establish open and fluid communication between all members involved in the project and at any given time have available the order, guidelines, specifications and information necessary for the development of the project.
- Ensure the team members meet the deadlines as well as well managing the budget assigned to the project in order to reach the desired results.
- Build and obtain product -market- share by working with sales colleagues to develop product and sales strategies as well as being the links between the customers and company multidisciplinary teams
- Determine product positioning

5. **Technology areas associated with the job:**

- Because of the role carried out by the Project Manager, he/she has an important role in each and every business area including the technology areas.
6. **Type and level of skills:**

   **Behavioural Skills**
   - Negotiation
   - Leadership
   - Client / Customer Orientation
   - Initiative
   - Flexibility

   **Technical Skills**
   - Project management
   - Business Acumen
   - Planning and Organisation

7. **Description of Career Path/Future opportunities:**

   The career path of a project manager normally starts off in any of the jobs defined in the profiles. As she/he gains experience she/he will participate in more important multidisciplinary projects, that cover diverse topics and in due course she/he will progress to more senior levels. As she/he gains more responsibility and experience she/he will move onto a project leader status.

8. **The type of person this job would suit:**

   Somebody who prefers to combine technical knowledge with business knowledge and has the ability to drive a team towards a specific goal would like this job. A person who would enjoy being the link between customers and his/her own company would be good at the job. A person who likes analysing the market and negotiating would enjoy the job.

   A technical degree (first cycle degree), or a business degree with a large technical component would be the normal entry requirement into the industry; an individual could then eventually grow into this type of job.

   People with Project Management experience in other industries often bring their project management skills to the industry; they often receive training in some technical aspects of the industry.

1. ______________________________
1. **Broad Job Area: Research and Technology Development**

2. **Examples of Job Titles:**

   - Research Engineer
   - Research Scientist
   - Senior Research Engineer
   - Senior Research Scientist -(Laboratory)
   - Principal Scientist -(Laboratory)
   - Principal Engineer
   - Senior Technical Expert
   - Principle Technical Expert
   - Research Fellow
   - Senior Fellow

3. **Job Description:**

   **The Vision:** The future of the ICT industry relies upon Technical Experts that define the future technologies of the industry. These people may have had a long career in the company or come from an academic background having shown outstanding excellence in research and development. One of their jobs is to imagine and suggest innovative products from their deep knowledge of emerging and new technologies.

   **The Role:** The Technical (or Technology) Expert advises, influences and guides a community in specific research or technology areas and provides technical leadership to internal and external groups. The Technical (or Technology) Expert is innovative and active in contributing ideas, solving problems and defining project content. She/he participates in, and contributes to, reviews and audits of tasks/projects/programmes and influences the development of his/her technology area e.g. by working with standardisation bodies. The Technical (or Technology) Expert translates current & future customer/ end user expectations to products, solutions and facilitates competence development, knowledge sharing, and coaching, and mentoring within her/his technology area.

   The Technology (Technical) Expert may also guide and instruct others and share her/his own expertise for the good of the project. She/he participates in the creation of technology strategies and participates in, and contributes to, reviews and audits of programmes. She/he contributes to decisions on technology options and participates in internal and external scientific forums. The Technology (Technical) Expert facilitates competence development, knowledge sharing and coaching & mentoring within his/ her technology area.

   **The Lifestyle:** Technology policy development requires the input from internal and external sources and is usually done on an international and multi-site level. The Technology Expert plays an active role in advising, influencing, and guiding a community in specific research or technology area and provides technical leadership to internal and external groups. Meetings are
held on a regular basis and the job requires extensive national and international travel both within the company and to external conferences etc.

4. Tasks Associated with the Job:

- At the zenith of her/his career the Technology (technical) Expert may be a company's global authority and a final reference point within the company for technical input. She/he may work as an internal consultant and is often responsible for advising other senior technical experts within the same discipline. The Technology (technical) Expert actively seeks new opportunities and contributes key ideas to projects and programs and has a thorough understanding of the company processes. She/he contributes to the company’s different management boards and maintains a broad view of emerging technologies. The Technology (technical) Expert is therefore required to master several areas of technology or have a very deep understanding in one particular technology area. She/he frequently contributes to the creation of the company’s technology vision & overall strategy.

- The Research Engineer/Scientist is often free to select her/his working methods and work independently on projects. She /he may choose to work mainly in a laboratory or in a company’s research and development unit. The Research Engineer/Scientist is able to handle external relations according to an agreed strategy and plans to be innovative and active in problem solving especially in research problems. She /he can often be a project manager on small projects.

- The Senior Research Engineer/Scientist has an ability to act as a specialist or project manager in certain technology area projects. She/he is able to handle external relations independently and is innovative and active in contributing ideas, solving problems and defining project content.

- The Principal Scientist is one of the company’s technology leaders, a member of the company’s advisory forums. She/he is active in seeking new opportunities, contributes key ideas to projects and promotes his/her technology area and project results. The Principal Scientist has an information sharing and coaching attitude to enhance knowledge transfer.

- The Research Fellow is a member of the internal and external international technology community. She/he is actively networking and invited and consulted by technology communities. The Research Fellow actively promotes new ideas in large international programs.
5. **Technology areas associated with the job:**

   - All ICT technology areas are associated with this job.

6. **Type and level of Skills:**

   **Behavioural Skills**
   - Analytical & Conceptual Thinking
   - Applying Knowledge
   - Communication
   - Creative
   - Open to new Ideas
   - Self Development
   - Professional Attitude
   - Decision Making
   - Initiative
   - Mentoring & Supporting Others
   - Problem Solving Techniques
   - Learning processes & methods

   **Technical Skills**
   - Understanding of Technologies
   - English and other languages
   - Networking Concepts
   - Quality Assurance
   - Technology Trends
   - Time Management
   - Team-Work
   - Creative in relation to technology
   - Flexibility & Self Learning
   - Technical Orientation & Interest
   - Strategy & Planning
   - Technology Trends (technical)
7. **Description of Career Path/ Future Opportunities:**

Often a career as a Research Engineer/Scientist starts in one specialist field. After about five years experience and having built up an internal and external network, a person would normally progress to a Senior Research Engineer or Senior Scientist role. With continuous enlarging of her/his area of technical expertise and building internal and external scientific networks the career development would lead to jobs such as Principal Scientist and later to Research Fellow. Principal Scientists typically have a minimum of ten years experience or the equivalent knowledge, while Research Fellowships are more a reward or recognition of an individuals expertise and accomplishments over a period of ten years or so.

A person in this type of role may choose to remain in a fundamentally technical scientific job for their whole career. The career path for these people also has the potential to reach the highest levels of management. These people may have a long career in the company demonstrating outstanding excellence in research and development throughout their working life.

8. **The type of person this job would suit:**

A strategic thinker with a deep knowledge of science and technology with excellent communication and networking skills would enjoy this job. This is a job for people with a Ph. D. (Doctorate) in ICT technology and with an academic research or people with a very strong background of achievement in industry background. This is a rather high level job for which head hunters would likely recruit on a global basis or for which a person would ‘grow’ within a company gaining years of experience and staying continuously abreast or ahead of the latest technological developments or new possibilities emerging from world wide research.

1. Broad Job Area: ICT Management
2. **Examples of Job Titles:**
   - Team Manager
   - Department Manager
   - Line Manager
   - Senior ICT Manager

3. **Job Description:**

*The Vision:* Within any effective Information Communications Technology organisation there
will need to be people who possess strong management capabilities. Management roles exist in all functions, (finance, sales, administration etc.) within a company. All management jobs comprise three roles:

**Lead:** Leading others by setting direction, motivation and achieving goals

**Manage:** Manage processes, resources, finance, time, property and people

**Do:** Many managers are also practitioners needing to be competent in the tasks for which their department is responsible. The more senior the manager the higher the percentage of leadership and the lower the percentage of ‘doing’.

ICT Managers are responsible for and measured on their ability to deliver business results. The results are expressed in terms of customer satisfaction, products sold, services rendered and profit made. Since management roles have a ‘Do’ content the roles vary from function to function. The rest of this profile concentrates on management roles in technical environments, whether it is managing technology issues, sales issues or business issues an appreciation of the technology and products being sold will be required.

Usually people who perform a role which is predominantly management will in the past have undertaken technical roles which may have led them into team and project leadership, where management responsibilities will start. This would be an unlikely path for people who enjoy possessing and developing in-depth technical understanding as knowledge will need to broaden with experience and seniority as strategic direction setting becomes an increasingly essential part of the role. A management role can take an individual to the very top of an organisation for example to Chief Executive or Managing Director.

**The Role:** Line managers, although likely to have sound technical knowledge in their particular field, specialise in the management of teams of people. Their role is to lead and motivate these people, which will include technical, or sales or marketing specialists of differing levels of experience, ensuring that they are aligned and committed to the organisation’s objectives.
The manager creates the pre-conditions for the team members to reach their targets through generating ownership and commitment, building strong morale, mentoring and encouraging an open working environment.

They also need to ensure that their people have the tools, skills, resources, processes and rewards to enable and encourage them to do their job. So for example managers will recruit new people, co-ordinated resources- assigning tasks to people, enable their specialists to develop technical and personal skills, and assist their people in career planning.

Managers of sales specialists will normally have demonstrated expertise in the role of selling and will set sales targets for their salesmen and women and assess achievement against those targets. Managers of technical specialists will have demonstrated competence in a technology area and will be able to break down large complex tasks such as design a widget, support a system or write a programme into tasks for specific specialists in their domain.

Often the manager can be seen as an ambassador for his/her department ensuring the value and capabilities of the department are well understood and appreciated both within the company and by customers. Equally often however the manager will have to accept broader company wide objectives which may mean she/he will need to change his/her department’s role or reduce the number of people, or change the benefits that the department personnel is used to receiving. Periods of downsizing can be challenging times for a manager.

**The Lifestyle:** An ICT Manager spends a substantial amount of time meeting with teams, key customers and suppliers, nurturing relationships. An ICT Manager is continuously developing his/her knowledge of the ever changing business environment and aligning the business with that, setting the strategic direction of the organisation. Effective communication and negotiation skills are a vital asset as is the ability to take important decisions. Many management roles, like many project management roles require the production and presentation of reports- progress reports, status reports, and feasibility studies for example. Successful managers spent time networking with other key people within and outside their organisation in order to be able to anticipate change and respond to them before or as they occur. Often senior managers will need information and to take action quickly and this will require working some long days and nights to deliver what is required when it is needed. Enjoying life as an ICT manager depends on the ability to anticipate change and plan for it so that when it happens it can be handled with minimum stress.
4. Tasks Associated with the Job:

- Acquisition, assessment, training/coaching and promotion of employees
- Tracks performance of team members, executes performance appraisal and sets goals
- Allocates new resources (human and other)
- Maintenance of current projects, following new and emerging projects and technologies
- Ensures performance improvement
- Defines requirements for development environment
- Responsible for cost centre
- Responsible for information exchange with more senior management
- Represents his/her own team or function vis-à-vis more senior management

5. Technology Areas Associated with the Job:

- All technology areas which relate to the different ICT technologies are associated with the job.

6. Type and Level of Skills:

   **Behavioural Skills**
   - Relationships
   - Leadership
   - Communication
   - Strategy & Planning
   - Decision Making
   - Stress resistant

   **Technical Skills**
   - Knowledge of the management of change
   - Business knowledge

7. Description of Career Path/Future Opportunities:

ICT Managers can reach the highest roles in the company such as chief executive or chairman. ICT managers often become entrepreneurs and start up their own companies. Over a long career ICT Managers would, as they gained experience, be made responsible for bigger budgets and programmes and a larger number of people.
8. **The type of person this job would suit:**

This is a job for someone who likes people, is a good communicator, and is able to lead people and get the their best work out of them. A strategic thinker would be good in this job.

A business first cycle degree in accountancy, management, commerce would be a normal entry level qualification for this type of job. Demonstrated experience would also be a useful asset. A master in Business or an MBA (Masters of Business Administration) would also be useful qualifications for this job. People with a technical or Engineering degrees might with business experience and postgraduate business qualifications grow into an ICT Managers job.

1. **Broad Job Area: ICT Sales Management**

2. **Examples of Job Titles:**

   - Junior Sales Manager
   - Sales Manager
   - Account Manager
   - Key Account Manager

4. **Job Description:**

   *The Vision:* Regardless of how wonderful a company’s products are, if no one knows about them, it is not going to be a successful business. Marketing (see separate profile), creates awareness for a company’s products. This works fine where the product is straight forward or well understood, the potential customer, now that she/he is aware of your product makes contact with the producer and asks for explanations on the benefits of the company’s product, compared to similar products from other suppliers that are on the market and that he may be considering buying. This is typically the way expensive complex consumer products such as cars, home entertainment systems and home PCs are bought.

   Many products in the ICT industry are highly complex, incredibly configurable and often it is not immediately obvious to see how they would be used. This is where the Salesperson and Account Manager come in. By being both knowledgeable about the product and about their customers businesses they are able to explain to the customer how the product could be used in the clients business and what the business benefit would be to the client. The business benefit might be expressed or described in terms of increased revenue, reduced costs or opening up new markets.

   In relation to other business areas, the ICT sector has grown exponentially due to the explosion of
The dynamics of the sector have created a highly competitive environment in favour of the information technology, which has created a highly competitive environment the dynamism of which is maintained by the continual entry of new competitors. In order to maintain a competitive position the attraction, capture and maintenance of the continued loyalty of clients has moved to the forefront of most company’s commercial strategies.

**The Role:** A salesman or sales-woman would typically be responsible for a territory, or a set of customers. This could be geographically based - e.g. all customers in part of a country, or industry based - e.g. all customers that manufacture cars. Depending on the product and the territory the Salesperson may have just a few customers or many hundreds of potential customers. In this latter case one of the key skills the Sales Manager must have, is to be able determine which customers she/he should spend time on, in order to maximise the revenue that can be generated for the company.

For larger customers the salesman will often call on his customers to understand their needs, explain the benefits of his products and to negotiate a commercial agreement that is good for the customer and the supplier. For smaller customers much of this work will probably be done on the phone or by email.

The Key Account Manager’s role is very similar except she/he only has one or a very few customers (accounts) to look after. This enables her/him to get to know the customer’s business very well and to be able to tailor and customise her/his companies solutions to best meet her/his customers requirements. She/he will often be bringing in experts and consultants from his or other companies to provide guidance to his customer in setting a strategy, or in selecting the best products or in implementing the solutions by means of her/his products.

Assuming that the client or customer is the key of any business and fundamental in the companies value chain we can understand the importance of the Key Account Manager’s job (KAM). He/she is the link between the client and the company, his/her function is to anticipate and know the clients needs and offer them solutions in the form of Information technology and telecommunications products and services that respond to the client’s needs.

**The Lifestyle:** The Salesperson and Key Account Managers job means she/he spends most of her/his time listening and talking to customers, either on the phone or in person. Some roles are exclusively telephone based, some exclusively customer site based, most are a mixture of the two. For those roles involving meeting customers there is often a lot of travel, as well as a lot of corporate entertaining as the salesperson seeks to better understand his customers needs and build a relationship where both parties can trust each other.

Often the Sales Manager or Key Account Manager will bring his customer to visit the company’s development laboratories or manufacturing plant so that her/his customer can understand future product developments and be assured of top quality products. Often these laboratories and manufacturing plants will be overseas, so the visit will involve foreign travel for the sales manager and his customer.

The dynamics of the sector have created a highly competitive environment in favour of the
customers. This means that the ICT Sales Manager has to have an in-depth knowledge of the market, the structure and organisation of the clients business and of the technological solutions available so as to be able to offer the best solution to the demands that arrive at her/his door.

4. **Tasks associated with the job:**

- A good understanding of the customers business and what is important in the business, e.g. price, delivery times, speed to market, dependability
- Knowledge of the organisation and activity of the clients so she can anticipate their needs with technical solutions that offer an efficient response to them.
- Define and prepare Sales proposals.
- Optimise results from on going assessment with the objective of creating client loyalty and guaranteeing future sales.
- Market analysis and analysis of competitors situation.
- Analysis of the clients profitability so as to implement appropriate sales actions.

5. **Technology areas associated with the job:**

- With reference to the technological solutions, the related areas will be those related to the telecommunications products and services.
6. **Type and level of skills:**

The training and development of a key account manager should cover abilities like business acumen, client orientation, negotiation, communication skills as well as business aspects like marketing strategy, 'the marketing mix’ ICT sector aspects and ICT technology trends.

**Behavioural skills**
- Negotiating
- Customer orientation
- Initiative
- Emotional Control
- Communication
- Persuasiveness

**Technical skills**
- Technology trends
- Technical documentation
- Product Knowledge relevant for the industry e.g. Telecommunications, business application software, computer servers, networks, storage devices……
- Business vision (business acumen)

7. **Description of Career Path/Future Opportunities:**

The career path of a Sales Manager might start in a technical area where she/he could consolidate her/his technical knowledge as preparation for the next stage of her/his development in the commercial area. Once in the commercial area she/he will acquire the relevant experience depending on her/his initial profile.

There is a strong link between the ICT Sales Manager career profile and the ICT Marketing Manager’s one since the two areas are interconnected. The Sales Manager is an important source of information for the Marketing Manager on the products and services to be sold and the segments of customers which are the critical markets for those products or and services.

As the Sales Manager’s career develops and she/he gains experience of the ICT industry and begins to meet targets and get the expected results, she/he will be given more authority and gradually move on to more important client portfolios. The Sales Manager’s career path could take her/him on to a more general management role, or a training manager role and might involve developing new key accounts.
8. **The type of person this job would suit:**

This is a job for a ‘people’ person who likes technology. This nature of the job means that the ICT Sales Manager has to be a dynamic person with wide ranging knowledge of the business and the business world. He/she must be pro-active so as to can anticipate the clients needs, with a gift for communication and negotiation. A solid technical training that has given her/him the necessary knowledge to carry out this job to a very high standard is needed as a base.

A first cycle degree in business studies with an emphasis on sales would be required for entry to this job area. In addition to that a degree with a high technical background and a focus on Information Communication Telecommunications technologies e.g. computer science, degree in telecommunication would be a good base for this job.