

# Innovation Management

## in the research environment

### Knowledge as a Key Asset

Global moves towards using knowledge, and associated innovations, as a basis for economic growth, development, wealth creation and global competitiveness have resulted in the emergence of the so-called “knowledge economy.” Vital to this new economy is the ability to produce new knowledge and to reproduce, apply and contextualise existing knowledge. This reality has resulted in a substantial increase in the skilled human resource component that deals primarily with knowledge.

With the shift in emphasis to knowledge, skills, innovation and enterprise as the cornerstones of the new economy, organisations and institutions (particularly those involved in research and technology development) are becoming increasingly dependent on their ability to develop, manage and measure their knowledge base and expertise. In other words, countries and companies are increasingly relying on the creative skills, knowledge and expertise of employees, based on experience and training, rather than on capital or natural resources, for economic opportunities and competitiveness.

It is the application of this human capital and its outputs, in the form of intellectual assets, to marketplace needs that generate company and country wealth. This is particularly true of knowledge-intensive, innovation-driven enterprises, which, as part of their revenue generation, have to be committed to creating, measuring, managing, and utilising Intellectual Capital. The Intellectual Capital (IC) of an enterprise can be defined as its Human Capital (HC) plus their Intellectual Outputs (IO) in the form of codified knowledge combined with the Social Capital (SC) resulting from the enterprise’s internal and external relationships.

Hence:

$$IC = HC + IO + SC$$

Simplistically, in the research environment, human capital relates to research staff, intellectual outputs relate to research results and social capital relates to the collaborations and contracts between researchers and other enterprises.

The realisation that the Intellectual Capital (IC) of a company can account for a substantial percentage of its market value (e.g. 95% for Microsoft) has resulted in the development of a number of IC measurement models, which are now in use by many thousands of companies around the world. Business experts continue to refine or propose better models to quantify this critical economic factor. In addition governments in both developed and developing countries are seeking to measure and manage the IC value generated by their funding support of the S&T and innovation systems in their respective countries. However, the success of any IC evaluation and measurement model, for both the private and public sector, is only as good as the knowledge assets captured, extracted and processed as inputs into the required reporting frameworks.

### What is Information and Knowledge Management?

Information and Knowledge Management refers to applying process to the creation, application, measurement, and management of Knowledge Assets. In terms of research organisations, such as the MRC, Information and Knowledge Management refers particularly to the management and measurement of the research process. Research in any organisation can be measured in terms of the inputs, and outputs as illustrated in Figure 1.

As a parastatal organisation funded predominantly through public sources, the MRC has an obligation to the public to account for, and measure the impact of its research-spending, while in private sector organisations, Information and Knowledge Management is vital for measuring the cost benefits of research efforts and for making informed decisions.

### Problems in Managing and Measuring Knowledge Assets

Extensive problems currently exist in harnessing IC, which result in increased costs and inefficiencies in IC management. Organisations wrestling with the capture and measurement of IC include all the knowledge-intensive

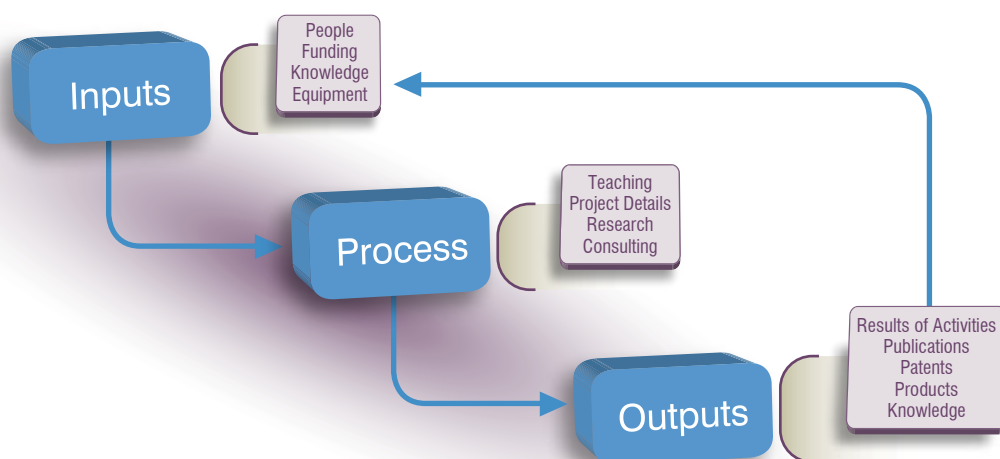


Figure 1: The Research Management Process

companies ranging from the largest pharmaceutical companies to SMMEs, and institutions like universities and technology colleges. The problems faced by big and small, private and public, well resourced and under-resourced entities include:

- inefficient or minimal management of IP outputs,
- fragmented and “siloed” databases (e.g. HR, Financial, Operations, R&D, Outputs),
- lack of standardisation,
- duplication of existing data,
- storage of inaccurate data, and
- the lack of systems to integrate existing, and capture new, data on the human capital and intellectual assets of the organisation for accurate and strategic measurement, reporting and management.

The lack of accurate and efficient access to human capital information as well as R&D, S&T, and innovation data (knowledge assets) results in lost project, product, market and contract opportunities, overstaffing, loss of competitive edge, and substantial costs in generating useful statistics to strategically manage and drive these knowledge organisations as well as national systems of innovation.

Another major problem in Information and Knowledge Management is that research staff, the most valuable assets of all R&D organisations, spend much of their valuable time collecting, processing and disseminating information rather than generating this (e.g. progress reports, financial reports, HR administrative reports and funding reports). What they should be spending most time on is planning, conducting, and managing research, optimising research outputs, developing knowledge assets, and creating social and economic impact. As a result, the resources of most public and private knowledge intensive organisations are not being used optimally.

## **e-KAM, a designed solution in Knowledge and Innovation Management**

In recognition of the above-mentioned problems in managing and measuring knowledge assets, as well as the value of people as assets, the MRC in partnership with a South African software development company IndevSA, has developed a solution that transfers the responsibility for managing information and knowledge to “machines,” leaving the people in organizations to apply their time and creativity to developing and implementing new knowledge.

### **What is e-KAM?**

e-KAM is a unique web-based Knowledge Asset Management System that integrates, captures and processes data on both human capital and intellectual assets. It enables the secure, online (screen vs. paper), real time input and collection, management and extraction of R&D related data. e-KAM incorporates the following functionality:

### **Data Collection and Validation Module**

This subsystem allows the entry of data into the system from other databases (via XML or ODBC interface) or online users (via web interface). The data is then validated against preset relationships and re-formatted for the e-KAM system usage before becoming an integral part of the system database. This is the only entry point into the system.

### **Database**

This contains all the data (irrespective of origin) relevant to the R&D activities and, as a security consideration, also contains information pertinent to user “roles” (i.e. access and usage levels) as well as the system functionality pertaining to data-page interaction. The database also contains an audit trail facility to map any insert/delete/update of system data.

### **Workflow Subsystem**

Procedures related to R&D and innovation (including technology transfer and project administration) can be managed efficiently through the workflow sub-system, which generates automatic emails to the relevant personnel and provides alerts on specific tasks and due dates, as required.

The sub-system manages data inputs and outputs, relevant documentation, project scheduling, management and staffing. It also provides for standards (preset response times) and escalations to supervisor levels in the event that the standards are not met. The workflow system is also able to manage the interactions between project initiators and output suppliers (via the PIM module described below). Users are able to configure the workflow engine either during installation or at any time while the system is installed.

The Workflow System approach replaces the traditional approach for managing processes (transfer of multiple copies of paper from desk to desk) by letting the system do the work. It therefore overcomes problems of paper getting lost, delays in attending to paperwork (in-tray syndrome), requirements for multiple hard copies, and the resulting expense.

### **Reporting Subsystem**

This provides users and subscribing parties with relevant and pertinent data in the most applicable format, either through pre-formatted reports, free format data extraction into “Doc”, “Pdf” or “Xls” documents, user defined reports or “search engine” functionality. The system will be supplied with a pre-formatted report selection; users will be able to add to these either during installation or at any time during system installed life. This will be the only output from the system.

### **Web Interface**

This is the primary user interface and can be either intranet or internet based. User interface with the system is browser resident via MS dot Net menu systems to ASPX or HTML screens with built in intuitiveness and online help functionality as part of an Employee Self Service (ESS) environment.

The advantages of the web interface are that it:

- Puts system power in the user's hands – any time;
- Connects users without geographical constraints;
- Creates “collaboration communities” of users;
- Allows work anywhere/anytime there is a connection;
- Provides a genuine “user friendly” user-system interface;
- Provides low cost systems and system maintenance;
- Offers easy installation and user training;
- Facilitates information exchange.

### Employee Self Service (ESS)

e-KAM is a web-based Employee Self Service (ESS) software system that enables research personnel or HR administrators to enter biographical details, employment information, training and expertise, project details, and R&D and innovation outputs in a uniform and controlled manner.

The ESS Approach allows direct access to data by users and transfers the responsibility for information management to the user, while the knowledge managers, e.g. IKMD, remain the custodians of the data and maintain control over data content and integrity. The ESS approach therefore leads to Empowerment and Transparency.

### Security

Strict security models ensure confidentiality of the information, by securing the database to record and field level, and by implementing 128-bit (and

higher levels) encryption for data using internet protocols. User “roles” define the access and usage levels of individual users.

### Data Content

e-KAM is designed to capture detailed information on:

- Research projects (abstracts, funding, costing, staffing, timescales and laboratory notes)
- Research outputs (publications, invention disclosures, patents, copyrights, trademarks, agreements, licenses, commercialisation, marketing, etc.);
- Research personnel (personal and professional demographics);
- Related activities (consulting, meetings, presentations etc.) (see Figure 2);

The system also contains all documentation and agreements related to the above.

e-KAM can be utilised as a stand alone system (for application in institutions where minimal or no systems exist) or integrated with and supplemental to existing organisational systems. XML templates govern data transfers, enabling cross-platform movement of data.

Globally, potential users of e-KAM include all enterprises and institutions that engage in R&D and innovation and all bodies (public or private) that administer, measure and manage knowledge assets and human capital,

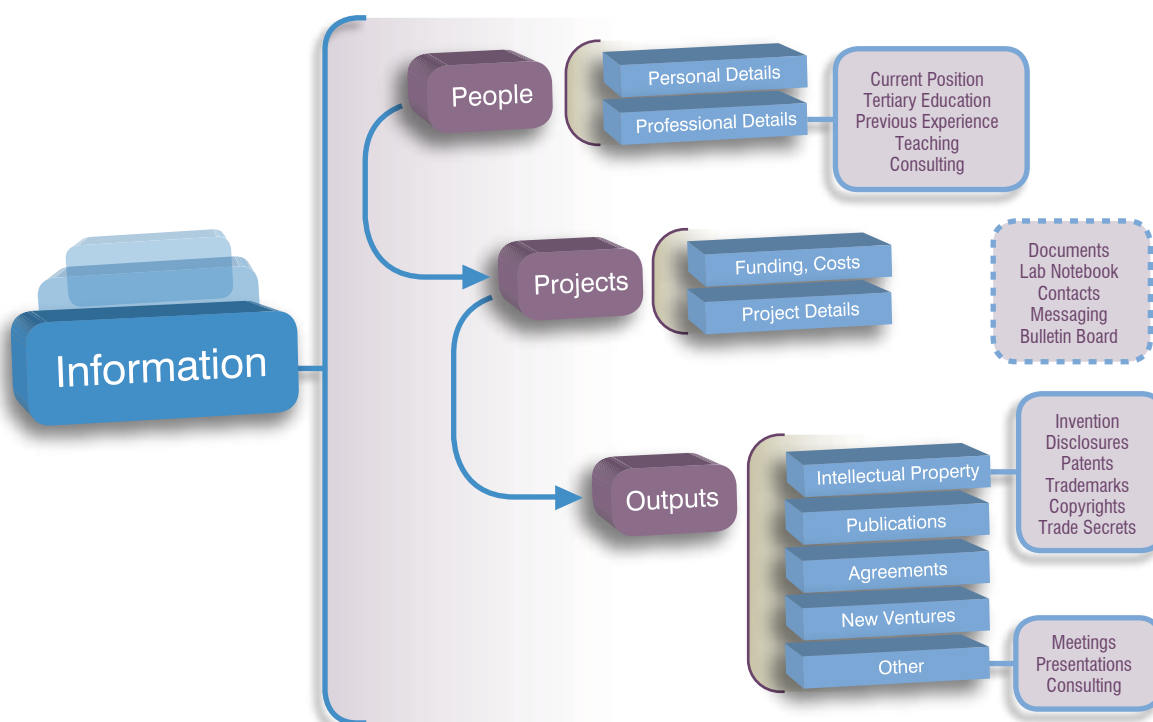


Figure 2: Data Content and User Menus for e-KAM

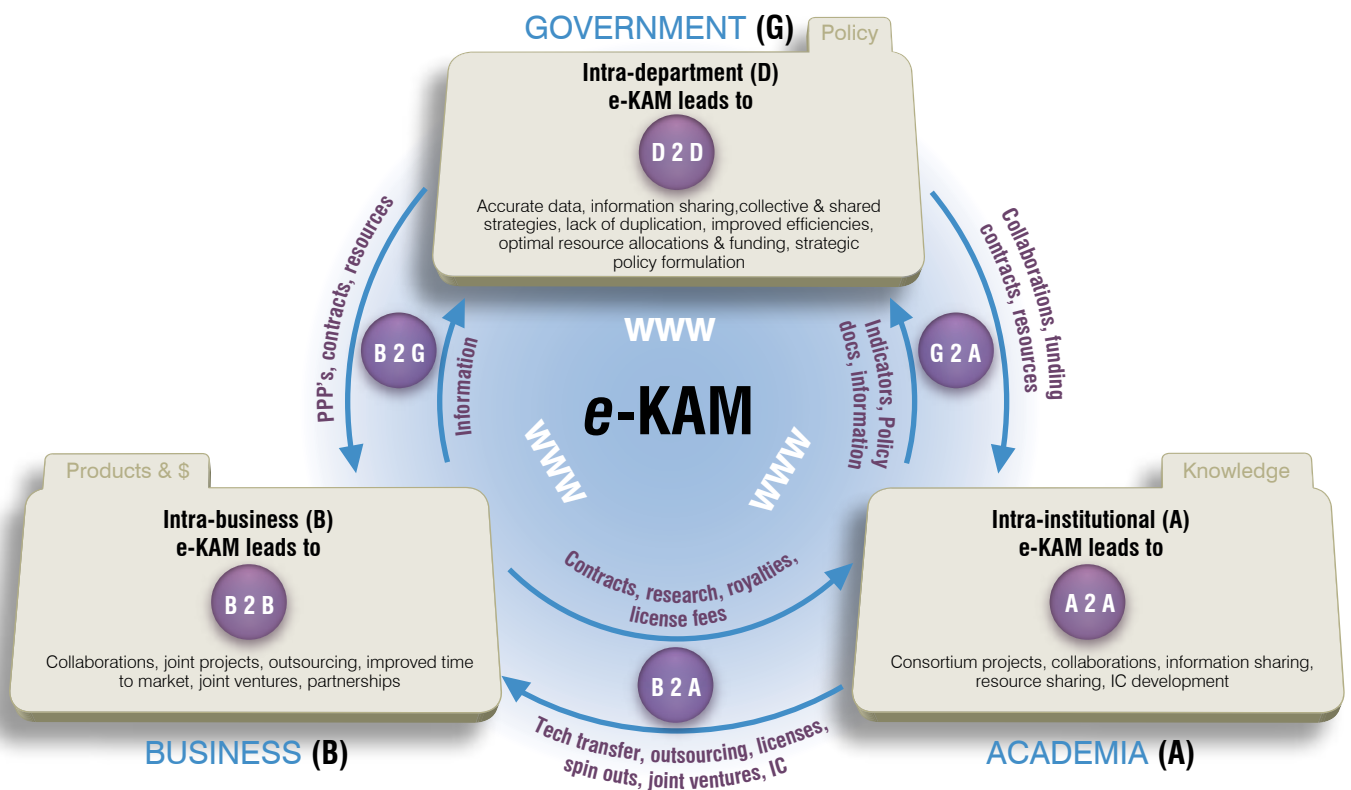


Figure 3: e-KAM and the National System of Innovation

i.e. national systems of innovation incorporating business, academia and government. If widely embraced, e-KAM will enable secure, online interaction between all players in national and international systems of innovation (see Figure 3), resulting in optimised innovation processes, strategic allocation and utilisation of resources, attraction and retention of quality HC, reduced time to market and enhanced revenue generation.

### What are the advantages of e-KAM to users?

e-KAM is designed to address current problems in information and knowledge management in all sectors involved in national and international systems of innovation. It allows:

- A systematised, workflow driven, research specific, control environment to enable users to correctly staff, administer and financially control both research teams and projects;
- Better information flow among researchers and between employees and managers;
- More time to focus on output related tasks;
- Increased operational effectiveness;
- Maximised throughput in the registration of copyrights and patents and the commercialisation of research outputs;
- Improved Innovation processes and therefore increased profitability from research projects;
- Supplementation and enhancement of existing information systems;
- Improved transparency;
- Accurate determination of the human potential and project capability of an organisation;

- Tighter control of staffing and application of R&D talent to provide the maximum result from each project;
- Enhanced retention of quality staff;
- Easy, secure access to the data for all relevant registered users;
- Empowerment of employees;
- Efficient and real time reporting of critical innovation statistics to government, thereby optimising input into innovation systems; and
- Facilitation of contact between commerce and R&D to match market requirements with R&D potential.

For business, academic and government sectors, e-KAM will provide improved efficiencies and cost savings as well as measurements of IC. From a revenue generation perspective, e-KAM provides a portal for commercial partners and research institutions to match market requirements with output potential for quicker project initiation, maximisation of opportunities and reduced product-to-market time. It also has the potential to provide governments sponsoring innovation systems with accurate, online statistics for improved allocation of resources and optimisation of national innovation potential.

This novel research and innovation management tool represents a major advantage for South Africa in terms of economic revenue from global markets and concomitant job creation. The web-based functionality of e-KAM will ensure minimum software costs, particularly in multi-campus corporations. The agreement with IndevSA enables e-KAM to be provided license free to all publicly funded research institutions in the country.