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Author(s)	Cormican, Kathryn; O'Sullivan, David; Browne, Jim; Yu, Ming; Dooley, Lawrence
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# **Innovation Management**

## **For Product and Process Development**

Jim Browne, Kathryn Cormican, Lawrence Dooley, Yu Ming and David O'Sullivan

CIMRU, National University of Ireland, Galway, Ireland.

EMail: dos@nuigalway.ie

### **Abstract**

Industry we are told manages change poorly. Surveys indicate that over 50% of change programmes fail to meet objectives. The reasons cited are all too familiar: poor goal definition, poor alignment of actions to goals and poor participation among employees. Innovation in industry is also managed poorly. In most companies the knowledge of employees remains untapped for solving problems, generating new ideas and implementing change. Harnessing this knowledge is a significant challenge in improving employee participation, fostering better change practice and ultimately achieving sustainable growth. In this paper some views of change and innovation management are presented that may significantly impact the efficiency of product and process development in companies.

### **Keywords**

Innovation Management, Knowledge Management, Product and Process Development.

### **Introduction**

A recent survey of Fortune 500 companies found that over 50% of change programmes fail to meet their goals (Strebel, 1996). Some analysts argue that this could be as high as 80%. Most change programmes consist of identified actions or projects in specific areas of the business environment and these projects are failing. Individual project success rates fair a little better. Hammer et al., (1993) highlight that between 50-70% of all reengineering projects fail to achieve their goals. The reasons for these levels of failure are numerous but the following are offered by a number of sources (Hayes et al., 1988,; Davenport, 1993; Kotter, 1995; Price-Waterhouse, 1996; Tidd et al, 1997; Zairi, 1999)

- (i) Poor goal definition
- (ii) Poor alignment of actions to goals
- (iii) Poor participation among employee
- (iv) Poor idea generation and problem solving
- (v) Poor mapping of actions to key processes
- (vi) Poor idea generation and problem solving
- (vii) Poor reporting of results

(viii) Poor management of actions

(ix) Poor communication

These reasons suggest a number of approaches to fostering a better approach to change and in the past various paradigms have emerged that offer effective tools and techniques for better implementing change – business process reengineering, world class manufacturing, total quality management, and technology management. While each of these areas have offered significant improvement opportunities two areas are emerging that can offer new insights into how to manage business change more effectively – innovation management and knowledge management.

## **1. Innovation Management**

Organisations are constantly changing and innovating to better meet the needs of a turbulent marketplace. The concept of managing this change and innovation is not something new. Since the turn of the last century, research into this area has been undertaken by diverse disciplines including social and occupational psychologists, sociologists, management scientists' organisational behaviorists and industrial engineers. Together, this research offers a rich reservoir of knowledge, which can be used to facilitate the management of change and innovation. Innovation can be described as “the process of bringing any new problem solving idea into use...It is the generation, acceptance and implementation of new ideas, processes, products and services” (Kanter, 1993). West and Farr (1990) present a broader definition of

innovation, viewing it as the “intentional introduction and application...of ideas, processes, products and procedures, new to the relevant unit of adoption, designed to significantly benefit the group, organisation or wider society”.

Innovation can be viewed as a cyclic loop (West and Farr, 1990), consisting of four distinct phases. These phases are recognition, initiation, implementation and stabilisation. The first phase is where the organisation recognises the potential scope that exists for an innovation. The source of innovation can be viewed as falling into two categories. These are programmed and un-programmed innovation (Zaltman et al., 1973). Un-programmed innovation is change that is not planned in advance. It can occur as a result of serendipity, the ‘eureka’ factor within organisations. Programmed innovation encompasses change that is planned in advance and has a definite deliverable such as the ‘bridging’ of a performance gap, solving a particular problem or requirement for example the introduction of external technology. The second stage in the cycle (initiation) involves the planning and development of the innovation, allowing evaluation of its impact relative to the organisations goals and existing constraints. During this phase, innovation are adapted, developed or even abandoned. The third stage involves the implementation of potential innovations that are deemed a suitable fit with the organisation. This is the stage where physical change becomes visible and can be time consuming and disrupting to organisational operations. During this phase, social

issues such as resistance and participation need to be taken into account to improve the probability of success. The final stage in the process is that of stabilisation, where the innovation is established as part of the organisations systems and hence prevents slippage back to pre-existing norms. After this stage, the process returns to the recognition phase, demonstrating that the process is a continuous loop that runs continuously.

Against the current background of the learning organisation, the innovation process loop is receiving ever-increasing inputs of potential innovators. This is as a consequence of more highly trained people within the organisation, actively seeking to engage in the process. If this scenario is allowed to occur without any structure or controlling direction, then the innovation loop spirals out of control and innovations is undertaken for the sake of motivating employees rather than operational advantage. For this reason, the innovation process must be effectively managed to ensure that a balance is maintained between the competing needs of implementing innovations that best support the organisational goals and maintaining and promoting creativity and participation of employees in recognising and initiating change.

## **2. Knowledge Management**

Manufacturing organisations are increasingly dependent on knowledge and information in order to increase innovation, efficiency and effectiveness in their operations. Consequently, effective problem

solving skills, better idea generation and enhanced decision making capabilities are replacing manual skills and long hours as their basis for adding value (Wilson, 1996). This is particularly evident in processes such as product and process development, which depends more and more on the development, use, and distribution of these knowledge based competencies. As a result of this, a new paradigm often referred to as the “knowledge organisation” is emerging. Knowledge is a key resource that must be managed if improvement efforts are to succeed and businesses are to remain competitive in global markets.

Knowledge can be defined as the integration of ideas, experience, intuition, assertions, skills and lessons learned that have the potential to create value for a business by informing decisions and improving performance. In this view, knowledge is a key enabler to product and process development. However, in order for knowledge to be useful it must be available, accurate, effective and accessible. Two major challenges that face organisations are (a) facilitating the creation or generation of knowledge and (b) converting individual skills and competencies into corporate knowledge, and know how. In order to do this knowledge management initiatives must be put in place.

According to Blake (1998) knowledge management is “... the process of capturing a company’s collective expertise wherever it resides and distributing it to wherever it can help produce the biggest payoffs”. Ruggles (1998) regards knowledge management as,

"an approach to adding or creating value by more actively leveraging the know how, experience and judgement resident within, and in many cases, outside the organisation." Taking these definitions into account knowledge management can be considered to be a systematic and organised attempt to use knowledge within a company to transform its ability to generate, store and use knowledge in order to improve performance. In short, the overriding purpose of knowledge management in terms of product and process development is to make knowledge accessible and reusable to everyone involved in these processes. The principle goals of knowledge management for product and process development are as follows:

- To improve the generation and creation of ideas.
- To act as a catalyst for innovation and creativity
- To ensure that the best knowledge is being applied to decisions.
- To make individuals' knowledge more accessible to others.
- To disseminate knowledge around the firm

There are clearly linkages between innovation and knowledge. In our research we have explored these linkages in how they relate to the management of product and process development. Before exploring this research, let us look briefly at product and process development.

### 3. Product and Process Development

Product and process development are the lifeblood of all manufacturing organisations. It is through developing innovative new products that companies achieve competitive advantage, increased market share

and customer loyalty. On the other hand, new process development increases efficiency and effectiveness through faster cycle times, lower operating costs and greater efficiencies. Product and process developments are inextricably linked. Many of the advantages gained by new product developments are often only realised when closely coupled with process developments which insures that the right products are delivered to the customer, on time, with zero defects. Figure 1 examines the rates of product and process development in an organisation. The rate of product development peaks about the time of the design standard for the new product. After that it declines and the rate of development to improve the production process increases. This occurs because manufacturers cannot focus on improving the production processes that will produce the product until it has been standardised (Betz, 1998).

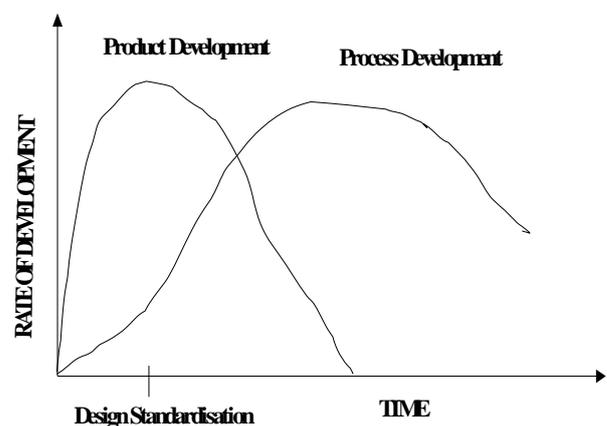


Figure 1: Rate of Product and Process Development

Integrated product and process development (IPPD) is a key imperative, which allows a company to provide solutions to customers pro-actively in a rapidly changing environment. In particular, IPPD provides

uses and develops all the required information to formulate, design, develop, produce and support effective products and processes. It is an expansion of concurrent engineering, which uses a systematic approach to the simultaneous development of a product and its associated production to satisfy customer needs. IPPD results in pro-active identification and management of risk; the elimination of re-works and significantly reduced development costs and lead times. Being first to market is critical because it allows a company to be recognised as an innovator, and generally provides an opportunity for the company to recover a large part of the development investment cost through value pricing and other market positioning strategies. It also results in being further ahead on the learning curve when a competitive product is introduced. Furthermore, the entire development process is more cost effective because decisions are made earlier rather than later in the development cycle when the cost of change in terms of time and money are significantly higher.

#### 4. Innovation Process

Both product and process development involve an innovation process that although not identical have very much in common. All innovation involves ideas (or problems) and actions and these actions must be tied to goals to optimise the utilisation of scarce resources. Of the many approaches currently used to facilitate the innovation process, our research suggests that seven elements provide the essential ingredients. We have labeled them for convenience as: Customers,

Goals, Innovations, Projects, Teams, Models and Results. These seven elements provide tools that facilitate innovation in product and process development in the organization. The seven elements are illustrated in figure 2 that adopts a funnel metaphor after Hayes et al (1988).

The concept of the funnel is that ideas and problems (innovations) are fed into the mouth of the funnel and constrained by various elements at its neck. Innovations that make it through the funnel become projects. When projects are implemented they change performance which is measured through results and compared with initial goals.

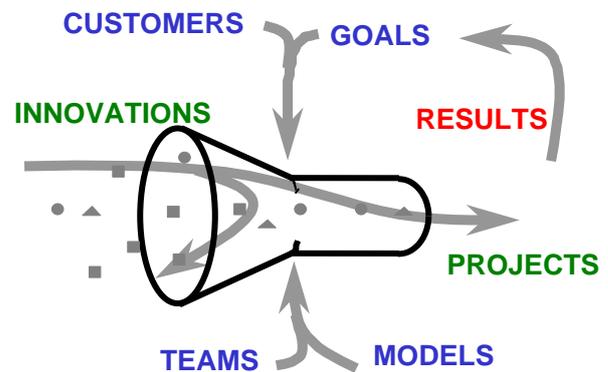


Figure 2: Innovation Funnel

Examining each element in a little more detail will explain the innovation process a little more detail.

##### *Customers*

This element gathers a number of techniques that support deployment of the ‘voice of the customer’ into the innovation management process. Customer information is generated from existing information such as warranty claims and order requirements.

Additional information can be generated by encouraging and capturing complaints and also by soliciting requirements through Delphi forecasting and kano analysis techniques. The way customer information is formatted and used is central to its usefulness. Large wordy reports are of limited use. On the other hand concise and ranked keywords can be easily looked up and related to the goals and actions that appear later in the process.

### ***Goals***

This critical element gathers four core techniques together that have been labelled Statements, Requirements, Strategies and Measures. These define the path the organisations management have chosen to progress the organisation in the future. The requirements identify the pressures exerted by the various stakeholders on the organisation that must be complied with. These requirements shall influence the strategies and supporting measures pursued to achieve the organisation vision statement. Through deployment of these requirements, strategies and measures to the innovative efforts of the organisation shall result in a portfolio of actions better aligned to achieve the organisational goals.

### ***Innovations***

The seeds of innovation are problems and ideas. Problems can be identified proactively (e.g. FMEA) or reactively. Ideas can be generated through benchmarking, training, seminars and so on. A useful approach to idea generation where one does not exist is the use of business stimuli. Stimuli can be gathered on

competitor activities, market trends, cultural trends and so on. These stimuli can then be used to create ideas which when ranked can be fed into the funnel and may become large or small projects, initiatives and tasks.

### ***Projects and Quickwins***

Innovative actions are implemented through the elements of quick-wins and projects. A quick-win can be defined as any action that does not require significant resources and hence can be implemented immediately. Projects can be defined as actions that require significant resources in order to be implemented and hence must be developed in greater detail to allow management decide as to the appropriateness of the project relative to its current goals. As the projects and quick-wins are developed, they are refined, merged or split, based on the constraining forces of factors such as the goals, models or teams. The eventual projects and quick-wins that are implemented by the organisation shall better contribute to the achievement of the goals than would occur from an ad hoc process.

### ***Teams***

The teams element represents the human resource of the organisation that is available to the innovation process. This category acts as a constraint on the process since the availability and quality of people limits the amount and type of innovative actions that can be undertaken by the organisation. The level of constraints imposed by this lever can be reduced through the training and education. By providing more employees with the necessary skills, they can engage in

the process and allow more actions flow through the process.

### ***Models***

The models element is perhaps the most difficult for managers to understand and apply, despite the fact that most managers now openly discuss such change programmes as the supply chain and process reengineering. Models are critical for mapping the present and future structures of the organisation and identifying areas where scope exists for change to take place. The use of models allows the identification of the core processes, essential to the organisation's continued success and can focus the types of innovations that are undertaken. In this way the models defined by the organisation act as a constraint on the overall innovation process.

### ***Results***

The results element represents the output of the activity of implementing the quick-wins and projects. The implementing of actions within any organisation can result in positive or negative change. As all change will impact on the organisation's overall performance, a mechanism exists where the contribution of the actions undertaken can be examined. At a higher level, the contribution of the portfolio of implemented actions can be analysed relative to the goal achievement and remedial action initiated if necessary.

## **5. Innovation Knowledge Management**

Understanding the innovation process in terms of the seven core elements of the innovation funnel can help

us to categorise and integrate all of the essential information elements necessary for the management of innovation. By understanding the relationships between this information we can create relationships that transform it into corporate knowledge. Two strategies exist for harnessing corporate knowledge – codification versus personalisation. It is our view that for innovation to be managed effectively the right balance needs to be found between appropriate codification of knowledge (say logging problems) and personalisation (say working in teams). The two can not exist in isolation - finding the right balance is the key. In our work we believe we have found a good balance. Intranets or more particularly groupware offers exciting opportunities to build IT systems (codification) based around the concept of virtual workgroups. By selecting this technology, adopting its design architecture and building a suitable innovation management application – good synthesis is achieved between the 'hard' and 'soft' elements of change. Not all processes can be supported and it is necessary to have supporting methodologies and management levers available through the normal training channels. Combining an intranet and Groupware based knowledge management tool for innovation information with a sound approach and set of guiding management principles offers a credible and realistic solution to improving employee participation, reducing projects failure rates and ultimately achieving business goals.

## **6. Conclusions**

Taken together the techniques identified in for innovation management in product and process development comprise a formidable repertoire of know-how for any manager. By focusing on these fundamentals every manager can follow a consistent and sustainable learning curve towards managing product and process development. Putting it into

practice is of course the ultimate challenge. Training plays a very important part in addressing this. But any approach to training must be holistic. Detailed skills development in areas such as problem solving and performance measurement must first be placed convincingly with the context of product and process development as a whole. An increasingly important tool for putting these techniques into action is information systems. Groupware plays a critical role in providing a framework for managing the many critical pieces of information in product and process development.

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