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Idea Generation for Organisational Innovation

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Abstract

Modern organisations are under ever increasing competitive pressure to maintain market share, enhance product range, improve efficiency and reduce cost. The process by which organisations attain these improvements is through innovation. Over recent years, significant research has focused on the issue of managing the process of developing ideas to eventual organisational innovations. However, the process by which these ideas/solutions are generated and effectively managed is one, which currently operates in an 'ad hoc' fashion.

This paper strives to address this and propose a structured approach to managing idea generation. In order to achieve this, a literary survey of both Innovation and Creativity is undertaken to determine their inter-relationships and core traits. Following this, a methodology is presented to facilitate the organisational management of the Idea Generation process. An integrated software tool to support the Idea Generation process is also introduced. The purpose of this tool is to provide

an infrastructure for the effective management of the creation of ideas\problem solutions and their transfer to the Innovation Funnel.

Key Words: Creativity, Innovation, Idea Generation methodology, Innovation funnel.

1. Introduction

The ability of an organisation to grow and prosper is dependent upon its ability to generate new ideas and solutions and to exploit them effectively for their long-term benefit of the organisation. Over the past number of years, much attention has been focused on managing the process of exploiting these ideas and progressing them into innovations (Dooley and O'Sullivan, 2000). However, the process by which organisations generate these ideas and solutions is one, which has remained relatively unexplored and has been allowed to develop in an 'ad-hoc' fashion. Since the idea creation phase of the innovation process is relatively less costly in comparison to the later development stages of the process (Rochford, 1991), it is logical to maximise the output of the idea creation phase. In doing this, a larger number of higher calibre ideas\solutions will be available for exploitation by the organisation. Thus, through this greater choice of potential innovations as input for the innovation process, it is probable that the eventual outputs will be more effective and profitable, since increased competition between ideas will ultimately improve the quality of potential innovations being presented to the process (the inverse of the Garbage in- Garbage out paradigm!).

In order to better manage and understand the idea generation phase of the innovation process, this paper undertakes a literary survey of the areas of organisational innovation and creativity. From this survey, the authors distill a detailed methodology for idea generation management within organisations. Finally, a software tool, called *Creations* is presented, which supports the idea generation process by providing an infrastructure for managing idea generation\problem solutions. This *Creations* tool has been designed to integrate with the existing Innovation Manager software (Dooley

& O'Sullivan, 2002) and support the latter stages of the innovation process. Thus, through the integration of both systems, organisations will possess an infrastructure for facilitating the management of the innovation process from idea generation to eventual solution implementation and review.

2. Innovation

Confusion often 'clouds' the exact meaning of the term "innovation". Tidd et al. (1997) state that "novelty is very much in the eye of the beholder". In its broadest sense, the term originates from the Latin *innovare* meaning "to make something new". Essentially, innovation is a process of turning opportunity into new ideas and of putting these ideas into widely used practice. According to Tidd et al. (1997), innovation is a core process concerned with renewing what the organisation offers and optimising the way it generates and delivers its output.

Innovation may be classified according to the nature of the change it brings into effect (i.e. the degree of novelty). According to Rothwell and Gardiner (1985), innovation does not necessarily imply the commercialisation of only a major advance in the technological state of the art (a radical innovation), it includes the utilisation of even small scale changes in technological 'know-how' (an improvement or incremental innovation). Burgelman et al (1996) also identify types of innovation, namely incremental, radical and architectural. In their view, incremental innovations involve the adaptation, refinement and enhancement of existing products and services and/or production and delivery systems (e.g. the next generation of a microprocessor). Radical innovations involve entirely new product and service categories and/or production and delivery systems (e.g. wireless communications). Architectural

innovations refer to reconfigurations of the system of components that constitute the product (e.g. the effects of miniaturisation of key radio components). Damanpour (1990) views innovation as falling into three categories, namely technology, administrative and ancillary innovations. He views the potential scope for innovative change as effecting the technology application of the organisation, the interaction between the organisation's social and technical systems and the interactions that occur across the organisational boundaries.

Zaltman et al. (1973) propose that innovation may be programmed and non-programmed, thereby relating back to the planned and unplanned perspective of change. Innovation can thus arise from a definite and directed action, or as a consequence of reacting to emerging trends (Johnston and Kaplan 1996). Zaltman et al. (1973) also categorise innovation as either ultimate or instrumental. Ultimate innovations are considered ends in themselves, whereas instrumental innovations are undertaken to facilitate the subsequent introduction of an ultimate innovation. Thus, an innovative change does not have to contribute directly to organisational wellbeing, but instead can be a supporting development towards the achievement of another major innovation. An example of an 'instrumental' innovation could be the introduction of a new system or the adaptation of an existing system to support new product development (Utterback 1994). The final dimension defined by Zaltman et al. (1973) is that innovation may be routine and radical in its nature. A routine innovation may be viewed as the introduction of something similar to previous organisational practice, although its specifics are new to the organisation. A radical innovation, is also new in its specifics to the organisation, but differs fundamentally to existing organisational systems and results in larger and more disruptive change

(Johnston and Kaplan 1996). Innovation, like other types of change, may traverse a number of different spectrums. Urabe et al. (1988) define innovation as a concept that incorporates the entire development process from the generation of a potential idea to its successful implementation.

A number of theorists emphasise their belief that the value of innovation lies in its contribution to profits. Urabe et al. (1988) describe innovation as “an economic concept rather than a technological one... [that] does not constitute innovation if it creates no growth or pure profit”. In reality, it may often be difficult to justify certain innovations on strictly financial grounds (e.g. new telephone system) as many benefits associated with a proposed innovation may be indirect and cut cross functional boundaries. However, the adoption of a high level organisational systems view to evaluate the innovation relative to its contribution to achieving organisational goals is one way of overcoming this difficulty. Another issue that this definition of innovation raises is that not all innovation is economically valuable from its initial conception.

Drawing from these various perspectives of innovation, certain parameters can be determined. An overview of these parameters is presented in Figure 1. Innovation may be viewed as a change to the organisational systems that traverse between radical and incremental rates of change. Innovation may be viewed as driven from a planned and unplanned perspective and can be characterised as being between process and product focused. Systems innovation can focus on development of existing and ‘new’ processes, as well as process development to support development of a new product (Utterback 1994). Irrespective of the type of innovation being introduced, its overall

objective is to contribute to an organisation's economic wellbeing, either directly or indirectly in a manner novel to the organisation in question.

Insert Figure 1 about here

Roberts (1988) presents a view of innovation as consisting of two interrelated elements; the generation of the idea and the subsequent conversion of that idea into a useful application. Kanter (1983) also defines innovation as “the process of bringing any new problem solving idea into use ...it is the generation, application and implementation of ideas, processes, products and services”. The seeds of innovation are the ideas and problem solutions generated by the organisations (Urabe et al. 1988). Ekvall (1991) when discussing the development of a creative organisational culture, emphasises the concept of idea-management, where a focus is placed on "finding and taking care of ideas in the organisations operations".

Ideas can originate either as a reaction to a certain situation, that compels the organisation into action or they can originate as a proactive action to exploit a new opportunity (Sadler 1995). Van de Ven et al. (1989) suggests that ideas for innovations can originate from "a recombination of old ideas, a schema that challenges the present order, or a formula or unique approach that is perceived as new by the individuals involved". An innovative idea therefore can originate from a broad spectrum of sources. Potential innovative sources include customer complaints, corrective action systems, suggestion boxes, supplier developments and benchmarking studies. Drucker (1985) asserts his belief that the source of innovative opportunity arise from (1) unexpected occurrences, (2) incongruities, (3) process

needs, (4) market changes as well as changes in (5) demographics, (6) perception and (7) new knowledge. King (1990) notes a diffusion bias towards innovation being imported from outside the organisation, rather than internally generated. A possible reason for this may be that it is easier to adapt the creativity of someone else, than develop and maintain a creative organisational environment.

3. Creativity

Creativity is that which “results in the generation of new and useful ideas or the combination of existing ideas into new and useful concepts to satisfy a need” (Farid-Foad et al., 1993). Creativity has frequently been likened to a mysterious and powerful process owned by a select and fortunate few. However, according to Maslow (1954), creativity is not just the remit of genius, but instead is “the universal heritage of every human being”. Therefore creative ability is something, which is present in every individual and thus can be developed or suppressed.

3.1 Defining Creativity

Amabile (1998) defines three components of creativity: expertise, creative-thinking skills and motivation. The level of creativity within an individual is relative to the mixture of these three components. Expertise refers to the technical and intellectual knowledge that an individual possesses, as well as the manner in which that organisation manages this collective knowledge. Creative thinking refers to the individual's skills that facilitate imaginative problem solving. Motivation refers to the intrinsic and extrinsic factors influencing an individual to be creative (Wreath 1998). Each factor is interrelated and a development in one area can exert a significant effect on the other two. The environment can also contribute significantly to increasing

expertise, creative thinking and motivation within an organisation and ultimately affect the creative output. The effective management of these three components of creativity, together with other relevant factors may increase an organisation's creative capability through developing an appropriate culture. Kao (1989), when discussing creativity presents the view that creativity is the sum of the following functions; the creative person, the creative task and the organisational environment (i.e. culture). Therefore all of these elements need to be considered in order to enhance creativity.

Creativity is in essence an individual pursuit, which may or may not draw on others for inspiration and validation. One of the proposed methods by which creative action occurs is thought to concern incubation within the unconscious mind of the individual which then presents the conscious mind with the creative ideas which the individual puts into action (Weisberg, 1986). Creative responses are the result of one of two processes, (a) a 'new' situation contains elements similar to those of an old situation, thus these elements serve as the basis for generalising the old response to the new situation or (b) if the new situation is completely dissimilar to previous situations, then the solution is to behave randomly combining various responses in numerous ways. Problems solving creativity is proposed to consist of the generation of a novel solution to the problem based on one of these approaches. According to Majaro (1991), creativity can be divided into three categories, depending on how it originates. These are normative creativity, exploratory creativity and creativity by serendipity.

Normative Creativity

Normative creativity focuses on generating ideas to solve specific needs, problems and objectives. Although the pre-defined nature of normative creativity renders it

more cost-effective than other creative approaches, it may also restrict the field of creative vision.

Exploratory Creativity

Exploratory creativity focuses on generating a broad spectrum of ideas, which may not necessarily be related to known requirements or demands. It differs from normative creativity in that it does not focus strictly on finding specific, almost pre-meditated solutions to known problems. Exploratory creativity reveals opportunities, which are not always exploitable in commercial terms, whereas normative creativity is results orientated. However, the exploratory creative approach is not 'blinkered' by goal orientation and so may uncover a wider selection of ideas and suggestions from which a viable solution may emerge. Exploratory creativity is particularly useful for extrapolating from current knowledge and technology towards the future. A hybrid of normative and exploratory creativity can potentially provide a balanced combination of goal-orientation and imaginative freedom.

Creativity by Serendipity

Creativity and the resulting innovation are said to take place by serendipity when the idea underlying the innovation is discovered by accident. Proctor (1999), however, suggests that idea generation is a process that does not occur by chance and maintains that ideas only occur 'simultaneously' to those who are curious or inquiring or engaged in a hard search for opportunities, possibilities, answers or inventions. It is also widely recognised that immersion in one's subject matter can be an important factor in gaining creative insights. The creative thinker must be sufficiently immersed

in the problem to facilitate the reception of creative insights yet at the same time sufficiently detached from it, to consistently see it afresh.

3.2 Creativity within the human resource

The level of creative output within an organisation is dependent upon the creativity of its human resources (Cumming 1999). Creativity is specific to the individual and dependent upon factors such as their education, skills, imagination and working environment. Brennan (1996) highlights that the failure of individuals to reach their full creative potential often relates to the inadequate development of both hemispheres of the human brain. The human brain can be viewed as being composed of the left and right brain; the left brain is associated with logic, detailed orientated facts and words where as the right brain is associated with feelings, imagination, symbols and images. In relation to creativity, there is a need to focus on an individual's training and education relative to the development of both sides of the brain, thus achieving a satisfactory balance within the individual. This ensures that the suggestions generated by the employees are a suitable mix of logical and imaginative ideas. The development of a learning organisation environment, where participation and empowerment flourish can contribute significantly to increasing expertise, creative thinking and motivation within an organisation and ultimately the level of innovation. The effective management of these three components can increase an organisation's creative capability through developing an innovative culture.

An negative mind-set can be one of the biggest obstructions to the creative process. According to Proctor (1999), mind-set is a condition where an individual is over-sensitised to some part of the available information at the expense of other parts.

Mind-set dictates that there is one way to solve a problem: the tried and trusted method. Mind-set avoids challenging convention and trying new ideas. There is assumed safety and predictability in applying previous experience and traditional solutions to new problems. Mind-set can be of value in that it develops sensitivity to important or risky areas and creates an awareness of developing patterns in problem occurrence. However, mind-set or the 'safe-bet' approach can stand in the way of progress and create difficulties when new or unprecedented problems arise.

Elam et al. (1987) claim that breaking the *cognitive* and *perceptual sets* of the individual and accommodating certain factors may lead to enhanced creativity. These factors include:

- *Divergent thinking*: is characterised by the production of a variety of alternative solutions for a particular task.
- *Task motivation*: represents an individual's attitude to a task, in combination with his/her perceptions of the reasons for undertaking the task.
- *Incubation and retained control*: refer to (a) the cessation of conscious effort on a problem for a period of time (*incubation*) and (b) an individual's execution of the task in any manner he/she chooses (*retained control*).
- *Competence*: pertains to the reduction of criticism and the affirmation of confidence in order to foster greater competence.
- *Stress*: can result in the early termination of alternative idea generation.

Similarly Finke (1992) identifies a number of initiatives to enhance creativity;

- Suspension of one's expertise.
- To be sensitive to mental blocks, incubation
- Divergent thinking
- Redefining goals
- Searching for limitations
- Considering extreme possibilities
- Seeking out new relations by representing or restructuring the problem in form of mental images; visualisation and visual analogies.

3.3 The Creative Process

Kao (1989) presents an alternative view of the individual's creative process. He views the process as consisting of six phases. According to Kao (1989), the initial phase of the creativity process is 'interest', where an individual's intuition or emotion leads them to scan their environment for opportunities or solutions. The second stage of the process is 'preparation', where planning is undertaken to "prepare for the expedition". Following this stage, the process enters the 'incubation' phase, where the individual utilises their intuition to "mull things over". This stage can be of indefinite duration and is often enhanced by outside influences and communication. The successful end of the 'incubation' phases is denoted by the 'illumination' phase, where the idea or solution finally 'comes together' from the intuition of the individual in "the 'eureka' experience". The next stage of the creative process is that of 'verification', where the individual rationally validates their creative output relative to the desired output. In the event that there are irregularities, the individual may return to earlier stages of the process to rework the process based on the new knowledge gained. In the event that the output is deemed positive, the 'exploitation' phase of

Kao's model begins where the individual or organisation rationally try to "capture value from the creative act". This final phase of the creative process may be viewed as representing the beginning of the innovation process rather than the creative process but also emphasises the importance of tight correlation between both processes to prevent potentially valuable creative acts from being "unintentionally dropped" (Rosenfeld and Servo 1991). Figure 2 highlights the integration between the creative and innovation processes, together with a number of the factors that facilitate their effective operation.

Insert Figure 2 about here

The degree of organisational creative output may be viewed as the product of the interaction between the collective individuals within the organisation, the knowledge that they and the organisation possess or decipher, the resources available to be expended on creativity and finally the culture and beliefs that exist within the organisation. Organisational culture will influence the types of processes, tasks and systems that exist within the organisation. Through effective development of these four areas, organisations may be able to enhance their creative output.

3.4 Creativity Culture

Given that creative people thrive in creative environments, organisations must strive to ensure that their environment is as nurturing as possible towards enhancing the resident creative collateral. Appropriate leadership, structures, and tasks, all interact with and influence the quantity and quality of creative work carried out by the members of an organisation. Leadership plays a key role in unleashing the creative

power of every employee. According to Ahmed (1999), empowering people to innovate is one of the most effective ways for leaders to mobilise the energies of people to be creative. Empowerment, when combined with leadership support and commitment, gives people freedom to take responsibility for innovation.

A flexible, organic structure, which encourages teamwork, also acts as a stimulant to people to be more creative. Communication and collaboration are generally increased and improved when people work in local, cross-functional or inter-organisational teams. An open, facilitating culture, in which a positive attitude towards creativity prevails, will transmit the message that creative input is appreciated from all levels and functional areas. While it is acknowledged that certain individuals possess highly creative abilities, organisations must also avoid assuming that creative individuals form a separate elite group, and that employees may be labelled as ‘creative’ or ‘uncreative’. Unfortunately, many new ideas are rejected or lost because they originate from inappropriate or traditionally unorthodox creative sources. It is clearly in an organisation's best interests to acknowledge and foster the creative talent of all its members, as the larger the ‘catchment area’ for new ideas, the greater the possibility of finding successful, innovative solutions in the process of new product development.

A strong, creativity-oriented culture greatly enhances the prosperity of innovation. Cultural aspects favourable to innovation include openness and sharing, teamwork, motivating and engaging people and embedding knowledge management activities in the day-to-day business processes, internal systems and structures. According to Ahmed (1999), an innovative culture can make it easy for senior management to

implement innovation strategies and plans. Deeply held assumptions and beliefs can allow an organisation to facilitate behaviour in accordance with organisational principles and goals. However, care must also be taken to ensure that the culture does not have a negative effect on the company's competitive strength. An adverse culture, for example one in which resistance to change, lack of interest and involvement, incompetence and perceptions of managerial distance prevail, will seriously hinder any creative initiative. The key to success is adaptability i.e. the ability to recognise and accept change and to deploy the cultural strengths of the organisation into competitive operational strategies.

The main characteristics of a culture in which creativity and the resulting innovation can thrive are:

- Leadership by visionary, enthusiastic champions of change.
- Top management support and encouragement of creativity, both financial and psychological.
- An effective communication system. Leaders must share the business vision with their staff and empower them to optimise their potential in achieving the business goals.
- Flexibility towards new thinking and new behaviour patterns. The creative organisation readily adapts to change and proactively searches for new opportunities.
- Customer Focus - the satisfaction of all customers, both internal and external, is the dominant prevailing ethos in innovative companies.

- A creative culture is outwardly focused, looking for ideas among competitors, customers, academe, suppliers, and even industries with a different focus.
- A creative culture highlights the importance of harnessing the talent of the entire organisation, stressing the point that " a good idea does not care who has it".

In building and maintaining a creative culture, leaders may have to overcome many obstacles. Kanter (1983), details the environmental factors which may obstruct the development of a creative culture:

- Dominance of restrictive vertical relationships
- Poor lateral communications
- Limited tools and resources
- Top-down dictates
- Formal, restricted vehicles for change
- Reinforcing a culture of inferiority
- Unfocused innovative activity

Building an organisational culture supportive of creativity is not something, which can be done quickly. It takes time to build trust between individuals and to reinforce the beliefs and norms we wish to encourage. Despite this obstacle, continuous efforts must be undertaken to ensure the development and maintenance of a creative culture in order to ensure systemic innovation.

4. Idea Generation Methodology

From the previous sections, it is evident that creativity within the organisational innovation process is a highly complex area. Drawing on many of the issues discussed, a methodology for idea generation has been developed. This methodology has been developed for the effective generation and management of 'the seeds of innovation' (namely ideas and problem solutions) and comprises of four distinct phases. These are:

1. Strategic Direction
2. Environmental Scanning
3. Opportunity Identification
4. Idea Generation

These stages cover the development of an idea from goal alignment and recognition of opportunity to definition of the final idea. They may collectively be referred to as "idea creation". The Idea Creation Methodology (Figure 3), which has been developed to facilitate creativity, is replicated in the software tool (presented later in this paper).

Insert Figure 3 about here

4.1 Strategic Direction

Three stages in the strategic direction process have been identified in the idea creation methodology, namely goal definition, strategy definition and measure definition. Organisational goals provide an overall direction-giving framework for an organisation. They steer the organisation's development process in the right direction

and allow for the alignment of potential innovations with the overall aims and objectives of the organisation. Organisational goals may be communicated in the form of mission/vision statements. The organisational vision defines the organisations aspirations of what it wants to become. It is the holistic view of the organisation and everything below it (strategies, policies, procedures) should strive to support the achievement of this vision (Dooley and O'Sullivan, 2000).

Strategy acts as a key guiding factor in any new development project. According to Crawford (1997), strategy serves as a loose harness for the integration of all the people and resources used in generating new innovations. Successful innovation management involves co-ordinating a portfolio of development projects within a clear innovation framework, informed by an overall business strategy. Research has repeatedly shown that organisations that lack a strategy for innovation, and simply innovate on purpose are poor performers. Equally, organisations that understand the overall business and their desired development trajectory are more likely to succeed. (Cooper et al, 1990).

The measures used to track the performance of innovation projects can also be clarified at this stage of idea creation. Performance measurement is the process of measuring an activity's efficiency and effectiveness (Cormican, 1996). The defining of strategy in terms of associated measures helps to 'operationalise' the organisational goals and communicates to employees where the organisation wishes to go.

By defining the organisational direction in terms of statements, strategy and measures, a number of things are achieved. These are:

- The organisation has defined a direction.
- Everyone in the organisation is clear of the desired direction.
- Organisational direction can provide a loose framework within which creativity can be focused.
- A number of potential stimuli (in terms of requirements) are defined and analysed.

The output of the *Strategic Direction* activity acts as a control for the later stages of the idea methodology in order to focus the output that is desired by the organisation.

4.2 Environmental Scanning

This stage of the methodology involves searching and monitoring the internal and external environment for potential stimuli to ‘initiate’ the idea generation process. Organisations must strengthen their communication networks, both internally and externally, in order to facilitate and promote effective environmental scanning. Aguilar (1967) defines the ways in which an organisation may scan the environment for information as:

- **Surveillance mode:** an undirected exposure to information with no specific decision or purpose in mind, for example, reading the newspaper.
- **Conditioned viewing:** a scanning activity which is more direct and deliberate than the surveillance mode, often involves pre-meditated searching for specific information.

- **Informal search:** a relatively limited and unstructured effort to obtain specific information, for example generating awareness of a particular issue within an organisation and requesting appropriate feedback when changes or developments occur.
- **Formal search:** in the formal searching process, a deliberate effort is made to secure the desired information. This may involve searching internal and external databases and utilising external sources of information such as libraries, research institutes and information brokers. Conducting a formal search for new opportunities requires considerable time, resources, the necessary facilities (e.g. databases, journals) and managerial support. Formal searching is usually carried out, therefore, in situations where the benefits of the search are perceived to outweigh the cost.

Research by Auster and Choo (1993) classifies the required information into the following categories:

- **Customer Information:** Involves compilation of details of product demand, current and potential market capacity, user preferences, problems and profiles.
- **Competition Information:** Includes information on competing organisations; their products, markets, strategies and competencies. Organisations must also obtain information on any products or services, which could be indirectly substituted for their own.
- **Industry and Sectoral Information:** This category includes information about industrial and sectoral policy; structural changes such as mergers, acquisitions and joint ventures, new entrants, leads for mergers and joint ventures (Butcher, 1998).

- **Technology and Processes:** A continuous learning approach must be taken in acquiring information about developments in production techniques, methods and materials.
- **General Economic Considerations:** General economic factors such as fluctuating exchange rates may affect the import/export activities of an organisation and influence its ability to operate in global markets.
- **Specific Economic Climate:** Factors such as the cost of raw materials, product price ranges and skills availability and cost are examples of the information relevant to the specific economic climate in which an organisation operates.
- **Regulatory Factors:** A wide variety of regulatory factors apply to most manufacturing organisations. These may range from health and safety legislation and planning and employment regulations to quality management standards and specifications. These factors present the guidelines to which an organisation must adhere, and so can restrict or inspire new product development.
- **Socio-cultural Factors:** In order to effectively plan for the future, an organisation must be aware of and prepared for socio-cultural changes in its external environment. Demographic changes - for example, an ageing population - can present new opportunities and challenges to organisations seeking potential new innovations. Such changes can also affect the skills base available to the organisation in developing new products

Actively scanning the environment is the first step to take in the idea creation process. However, mechanisms must exist whereby all forms of stimuli, regardless of origin, can be "harnessed" or captured. Accessible reporting, recording and sharing systems must be in place to avoid overlooking or dismissing potentially lucrative product

development stimuli. While the goals defined in the previous stage act as ‘pointers’ for potential beneficial stimuli, care should be taken to ensure that they do not overly constraining the scanning process. The desired output from this phase of the methodology is to open up the organisation’s employees to as many potential stimuli as possible (both goal aligned and serendipitous), which can then be used as input for the Opportunity Identification stage.

4.3 Opportunity Identification

The Opportunity Identification stage of the process is where the organisational resources interact with the potential stimuli in order to further develop the resources. The output of this phase is influenced by the individual organisations goals, but is also adaptive enough to be driven by ‘serendipity’. It is during this stage that aspects of the creative process such as synthesis and “incubation” occur (Kao, 1989). A wide variety of information and stimuli may be uncovered by the Environmental Scanning phase and presented as inputs to this process. During this stage of the process, the inputs are ‘embibed’ by the organisations human resource and ‘mulled-over’. Issues such as organisational culture, employee background and motivation can exert a significant influence on the operation of this phase of the process. During this phase, employees explore potential stimuli, follow hunches, experiment and sometimes take ‘leaps of faith’, while evaluating potential stimuli for organisational opportunity. The use of certain facilitation tools such as mind-mapping, data-mining and cross functional teams can act as an enabler to this activity. The output of this activity is a portfolio of potential opportunities that can be further developed and analysed to develop ‘concrete’ ideas, which occurs in the final phase of the methodology.

4.4 Idea Generation

The idea generation stage of the idea creation process is concerned with developing the stimulant or ‘seedling’ idea (proposed in the Opportunity Identification stage) into a more specific, recognisable concept for exploitation by the innovation process. This phase of the methodology reflects the “illumination” and “eureka” stages of Kao’s (1989) creativity process model. The output of this activity (ideas), can be either reactive or proactive in origin. A reactive idea is one which is generated in an attempt to restore the ‘status quo’ (e.g. problem solution), where as a proactive idea is generated to progress the organisation towards its Strategic Direction.

Various creativity techniques may be employed to flesh out and develop a vague suggestion into a concrete idea. The aim of this stage of the process is to exhaust all channels of thought so that, in as far as possible, every aspect of the idea is thoroughly investigated and explored. Within the idea creation methodology, idea generation consists of the following steps:

- **Model Stimuli:** Stimuli that are identified as potential opportunities for new product development may be modelled or mapped to predefined organisational parameters e.g. materials required or the production process to be used. This step serves to provoke creative thought on the idea with regard to fundamental themes and features related to the idea.
- **Brainstorm Suggestions:** So far, stimuli have been presented and opportunities identified, recorded and modelled. The next step in the idea creation process is to delve into the idea and exhaustively ‘tease’ it out. The brainstorming technique is a most suitable, adaptable technique for the purpose of idea generation and

development. In building ideas for new product development, it is important to have as many contributions to the process as possible, as this increases the likelihood of arriving at a valuable solution. Thus, group-work and high levels of team interaction are strongly recommended at this stage of idea creation.

- **Rank Suggestions:** Following the brainstorming session, suggestions may be ranked in order of priority or importance to the organisation. This step is not used to evaluate or criticise the suggestions, but to gain more information and insights concerning the potential application and usefulness of the ideas presented. This step may also serve as a further idea generating technique, as following the designation of rank or score, certain aspects of the idea may be re-considered and altered or a new idea initiated.
- **Define Idea:** Following all the preparation, which is undertaken to build a new idea, a statement of the idea may be presented or defined. The idea definition should encapsulate the core message of the initial stimulus or stimuli from which it originated and the relation of this new opportunity to the goals of the organisation. Idea definitions should avoid ambiguity at all costs as clearly defined, well-researched ideas form the basis of successful new product ventures.

This Idea Creation methodology provides the organisation with a step-by-step approach to idea generation. Each of the phases in the methodology draws heavily on the organisation's resources such as employees, skills, knowledge, communications and finance. The output of each phase of the methodology acts as input to the next, but may also act as an impact on the other phases of the methodology. An example of this is where a potential opportunity generated in the Opportunity Identification phase

can impact on the Strategic Direction stage. This feedback loop occurs through the organisations resources (namely employee), which bring their knowledge and experience to their next task. Thus, the methodology is constantly adapting as a result of the creative process.

5. The Innovation Funnel

Recently, research has been undertaken at the CIM Research Unit at NUI, Galway into the topic of ‘innovation management’. An approach entitled the ‘Innovation Funnel’ has been developed to effectively manage the innovation process within organisations (Figure 4). This model consists of a series of ‘stage-gates’ that screen and filter an action (initially an idea\solution) as it flows through the process. As a result of the screening process, some of the actions become ‘quickwins’, while other actions lead on to projects resulting in more significant innovation.

Actions that lead to ‘quickwins’ do not flow fully into the funnel and hence are implemented within a shorter timeframe. Actions that become ‘projects’ require significant resources and hence flow through the entire funnel. During this process, they become constrained and aligned by factors such as organisational goals, models, teams and resources. Thus, the further an action processes through the funnel, the more specified and developed it becomes. The screening process allows the ‘most suitable’ actions to be approved for implementation by management, while others are reworked, rejected or merged to re-enter the process again.

Once a project is approved, it enters the implementation stage of the process, where it is managed and controlled. In order to ensure effective control of individual projects

and the holistic system, a monitoring-feedback loop has been incorporated into the model. Each project has specific targets that allow its progress be evaluated on an ongoing basis. Similarly, the Results stage of the process monitors the impact that implemented actions have had on the organisational performance and its progress towards its target goals.

To date, research into the Innovation. Funnel model has focused on nurturing the idea or problem solution once created and deemed the idea generation phase of the process outside its research scope. In the following sections, the scope of the model is widened to include the process within the ‘stimuli’ funnel.

Insert Figure 4 about here

5.1 Creations Software Tool

The Creations software tool represents an additional module of the Innovation Manager software (Dooley and O’Sullivan, 2002) that has been developed to broaden the scope of the existing Innovation Manager software; namely the inability to provide an adequate infrastructure for the creativity process aspect of the innovation process. The Creations tool is designed to operate at the front of this process, facilitating the gathering and recording of stimuli to the innovation process, opportunity identification and idea generation. The output from the Creations tool is an idea\problem solution, which then proceeds into the Innovation Funnel to undergo further analysis, planning, screening and implementation.

The Creations tool has been designed as a generic tool, so that it may be used to develop and manage potential ideas and suggestions for any organisation. The design of the tool also aims to enable optimal accessibility through flexible, open communication systems, which are necessary for creative thinking to thrive in any organisation. The Creations tool facilitates teamwork and participation by allowing multiple user access and comparison of ideas suggested by different users. Ideas may be brainstormed over the company intranet, thus enabling the involvement of cross-functional team members. This feature may prove particularly useful to team members for whom traditional meetings and formal brainstorming sessions are impractical due to time and location restrictions. Additional features of interest in the Creations tool include its use in capturing potential ideas and suggestions from both the internal and external environment. By considering stimuli such as customer demands and changes in the marketplace, organisations can incorporate the "voice of the customer" into the creativity process. In accordance with the principles of traditional creative thinking techniques such as brainstorming, judgement of ideas is suspended in the Creation software until after the idea generation stage has been completed.

The Creations tool was designed to adequately reflect both the creative process and the various phases of the idea generation methodology (Table 1). Through this approach, it is hoped to provide organisations with an integrated structure that nurtures and protects creativity within its systems.

Insert Table 1 about here

5.2 Creations Tool

The Creations tool will be examined with respect to the three main areas of functionality that are Goals, Actions and Results (Figure 5)

Insert Figure 5 about here

5.2.1 Goals

Organisational goals steer the direction of the creation process. Goals highlight the organisations objectives that must be addressed and the strategies employed to realise these objectives. The Creations tool presents three views of ‘Goals’, namely Statements, Strategies and Measures.

Goals: Statements

Goal statements typically take the form of mission and/or vision statements. Goal statements guide the direction of the creative process. It communicates to employees, the organisational priorities that must be achieved and provides a context for framing some of their creative efforts. Through this, organisations can ensure that many of the potential innovations created are actively focused on moving them towards their predetermined vision.

Goals: Strategy

The strategy view of the Creation tool allows the user to describe the core strategies adopted by the company to fulfil its goals (Figure 6). The strategic objectives and individual or team responsible for implementation may also be detailed in this view. This section clearly defines the various ‘paths’ that the organisation has selected in

order to achieve its vision and these strategies can act as a strong source of inspiration for creativity. While the organisation wishes to encourage goal-focused creativity, they do not wish to exclude creativity due to serendipity. This is why the software has a default strategy entitled “serendipity”. This functionality allows employees the freedom to ‘think outside the box’ and propose potential ideas, which while they may not fit with the current organisational goals, may be too advantageous to ignore. This ensures that the maximum potential creativity is trapped by the system.

Insert Figure 6 about here

Goals: Measures

Performance measures may be defined in the Measures view of Goals. Macro Measures can be chosen from a predefined drop-down list including time, cost, accuracy and culture. Specific targets relating to the chosen macro measures can also be detailed in this view. This allows employees to focus on operational measures that are set and ‘mull over’ how this can be achieved. The defining of these Goals provides both focus and inspiration relative to the individuals’ creative efforts. It ensures that the organisational goals are actively communicated across the entire organisation rather than sitting on the CEO’s shelf gathering dust.

5.2.2 Actions

The "Actions" field of the Creations tool deals with the opportunity identification and idea generation stages of the idea generation process. This section of the tool allows the user to explore a range of potential stimuli, build ideas and map these ideas to the

goals of the organisation. The Creation software presents three views in the field of Actions, namely: Stimuli, Creations and Ideas.

Actions: Stimuli

The Creation tool allows the user to identify opportunities from a wide range of areas. These "stimuli" for innovation may be classified as arising from customer, competition, environment, technology and process, socio-cultural and regulatory factors. The user can create an entry in any one of these fields and/or observe the contributions of other users. Through this reiterative process, various stimuli are investigated and potential opportunities for the organisation are discussed. This cross collaboration concerning potential opportunities can facilitate the creative process by introducing diverse opinions and perspectives. This section of the tool also allows the user access to other information including the internet, customer relations systems, enterprise planning systems and quality systems. The aim is to provide users with access to as many relevant information sources as possible from which they can draw inspiration. The defined stimuli are then used as input to the idea generation phase of the process, which comes into greater effect in the next section of the software: "Creations". An example of the "Stimuli" view is shown in Figure 7.

Insert Figure 7 about here

Actions: Creations

Idea generation is accommodated in the "Creations" view of the Actions field. In this section, the user can recall and observe existing stimuli and record notes on the stimuli section, if desired. The software has been developed with functionality that

allows the user to sort the database according to specific categories they define. After examining the stimuli, the user can proceed to map any suggestions that they feel would benefit from further examination. Mind Mapping functionality is available to allows users consider the new idea under various categories. This enables the user to expand and develop the stimulus or skeleton idea proposed in the earlier phase. The third and final component of the "Creations" view is that of Brainstorming functionality. At the end of the Mind Mapping session, recognisable ideas in the form of strong suggestions should be beginning to take shape. These suggestions are further developed in the Brainstorming section. Through the company-wide intranet, the software permits the collection of a wide range of ideas and suggestions from multiple users across the organisation. Once all suggestions are collected, they are evaluated on a scale of practicality against effectiveness. Through the algorithm, a score for each idea is computed, allowing the user to prioritise the ideas for further consideration. While the ideas are ranked, no idea is dropped at this stage. Thus criticism is suspended until after the idea has been created in order to ensure the creative process is not impeded. Figure 8 provides an overview of the various elements of the Action field.

Insert Figure 8 about here

Actions: Ideas

The Ideas view of the Actions form documents all the proposed ideas generated by the creations software (Figure 9). This view also allows for the deployment of goals and teams with respect to the new idea. The type of change proposed by the new idea may also be classified in this section. This facilitates the defining of common

synergies across ideas, which may be exploited at later stages of the innovation process.

The Ideas view allows for the naming the project sponsor, leader and team members so that responsibility and communication can be established. This also allows for traceability, so that ‘idea generators’ can be rewarded once the organisational impact of the organisation is measured.

From this point in the process, the ideas flows into the Innovation Funnel, where it is further developed, aligned and evaluated as it progresses to becoming an implemented innovation. Thus, the integration between the Creations tool and the Innovation Manager ensures that ideas are not dropped but instead are nurtured and protected from initial stimuli to implemented innovation.

Insert Figure 9 about here

5.2.3 Results

The Results form of the Creations tool provides users with information concerning the progress of the generated ideas once they have entered the Innovation Manager software. Users are able to view who is responsible for the exploitation of their ideas and the eventual outcomes and influences on the organisation (Figure 10). Another view available to users provides a list of all employees that have been rewarded for their idea generation, together with details of the specific idea. This view is more than a source of additional information for the Stimuli section, as it also acts as a

motivator to engage more employees in the idea generation process. Thus the process becomes an ever increasing cycle of benevolent creativity.

Insert Figure 10 about here

6. Conclusions

The creative capabilities of an organisation are essential to its ability to innovate and survive in today's competitive environment. Systems must be in place that are capable of developing and holding concepts and ideas together in a creative balance, without rushing to some premature resolution and yet which protect the concepts 'falling between the cracks' of operational life within the organisation. To this end, a methodology for managing the Idea Generation process is presented, together in a supporting software toolkit that provides an infrastructure for creation. Through imposing loose structures on the creative process, it is hoped to attain a balance where creativity is nurtured and yet effectively managed in order to progress organisations towards its goals.

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8. Figures and Tables

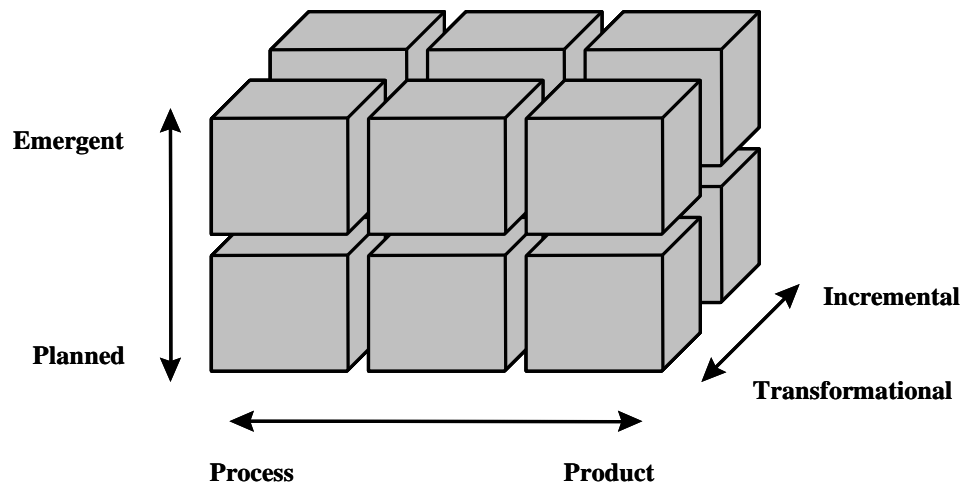


Figure 1: Scope of Innovation

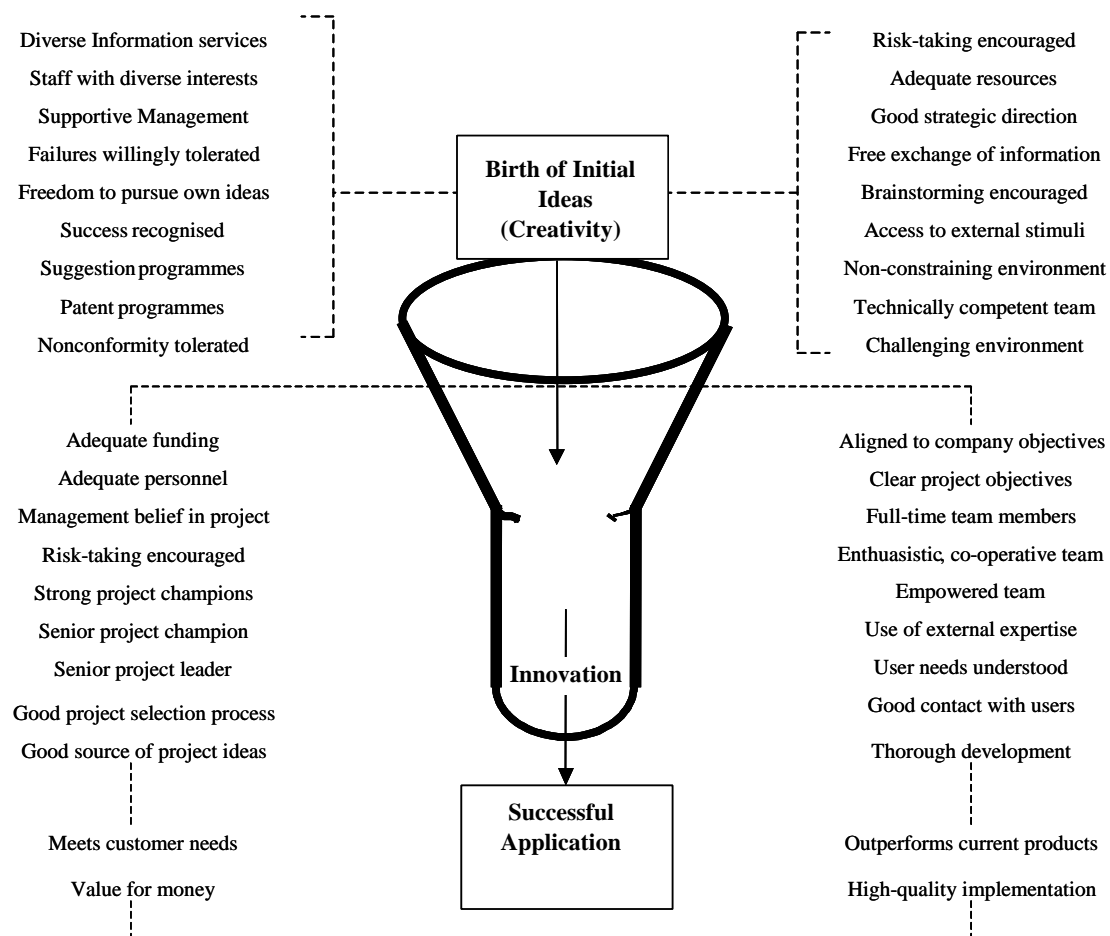


Figure 2: Factors affecting the Innovation Process (Adapted from Cumming, 1999 and Dooley, 2000)

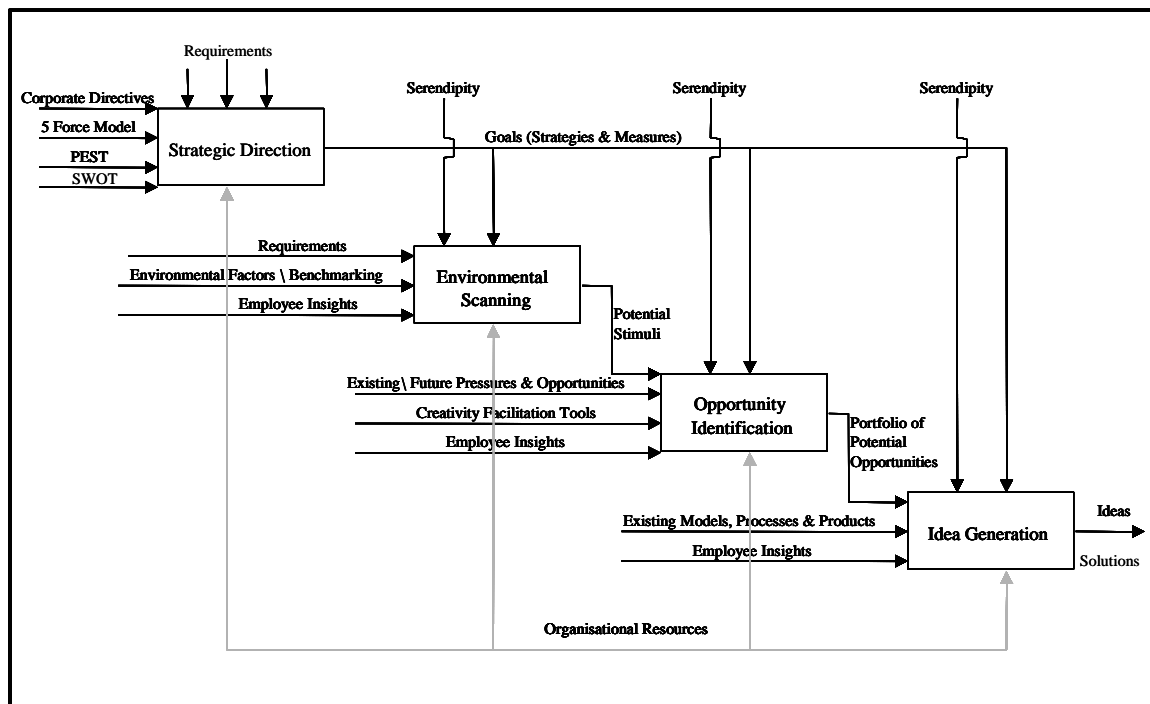


Figure 3: Idea Generation Methodology



Figure 4: The Innovation Funnel Model

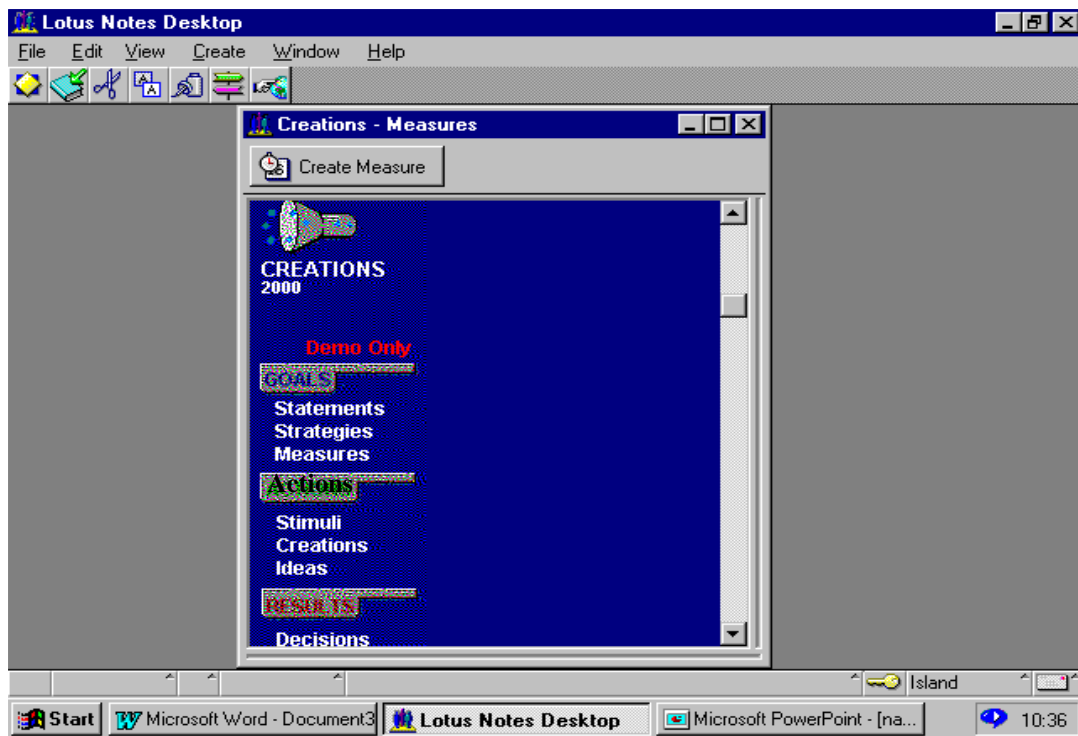


Figure 5: Creation Interface

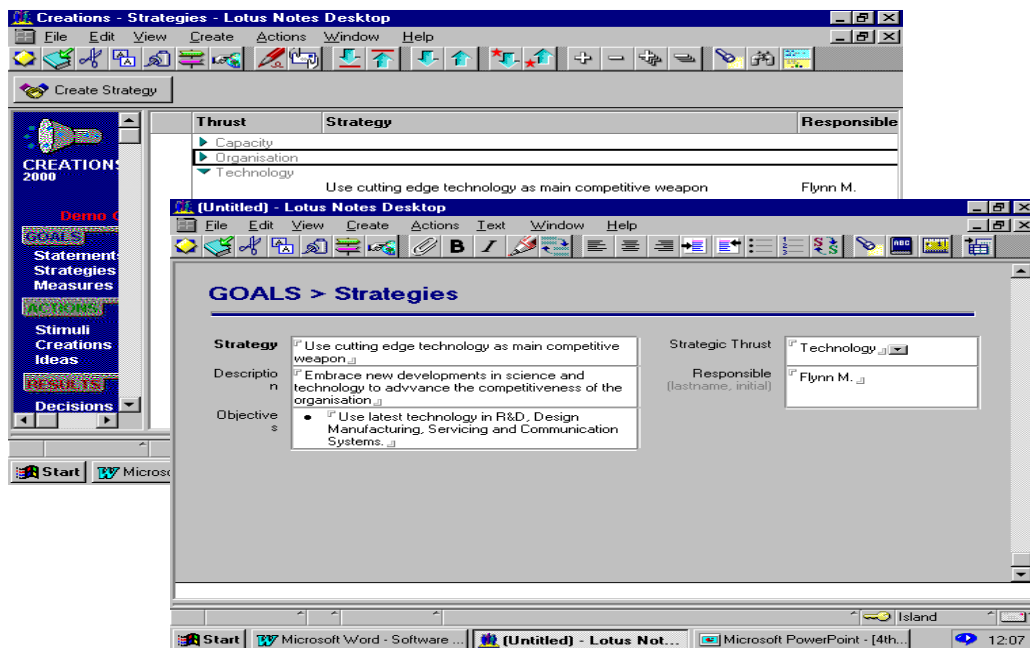


Figure 6: Strategy view

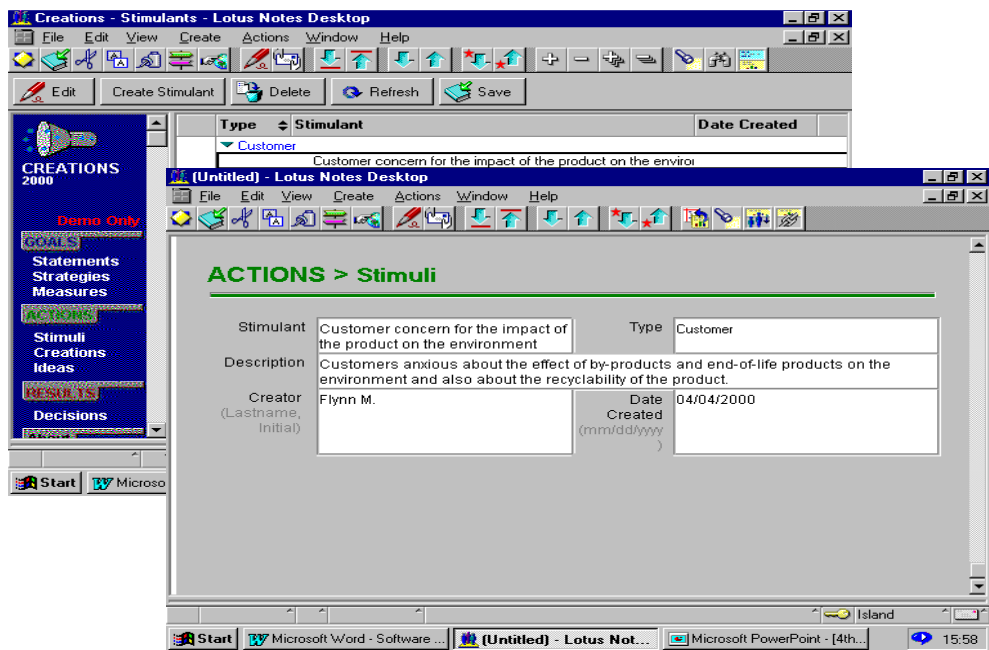


Figure 7: Stimuli view

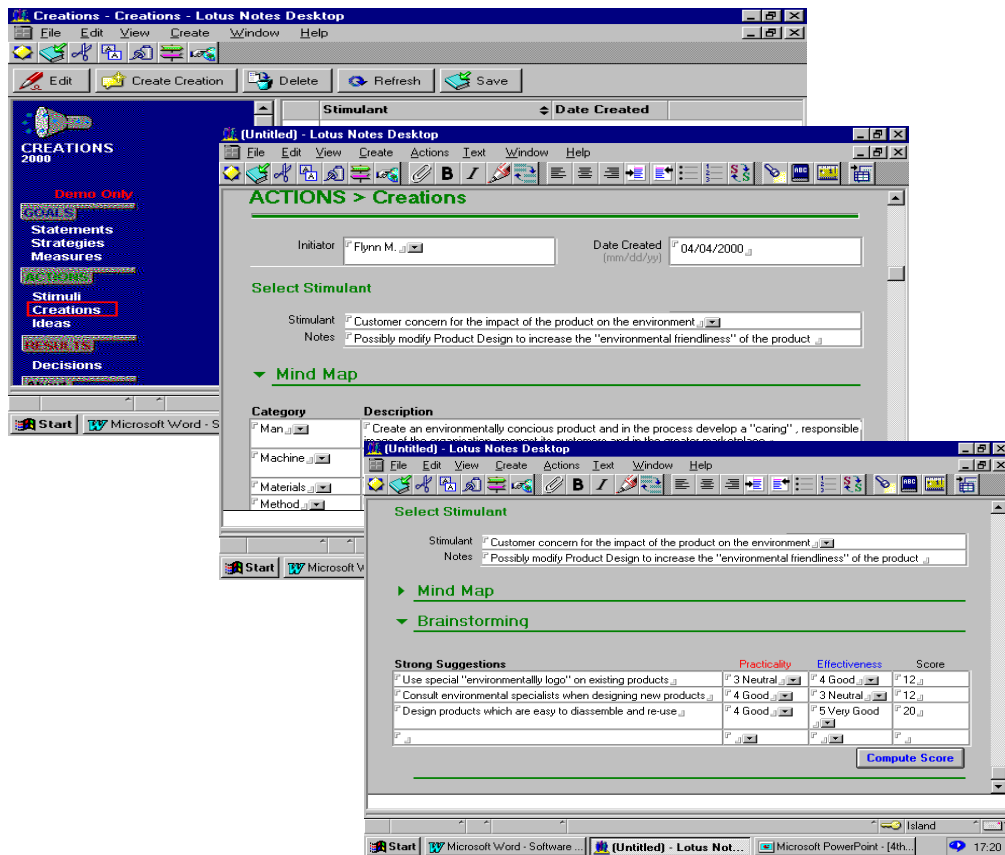


Figure 8: Creations form

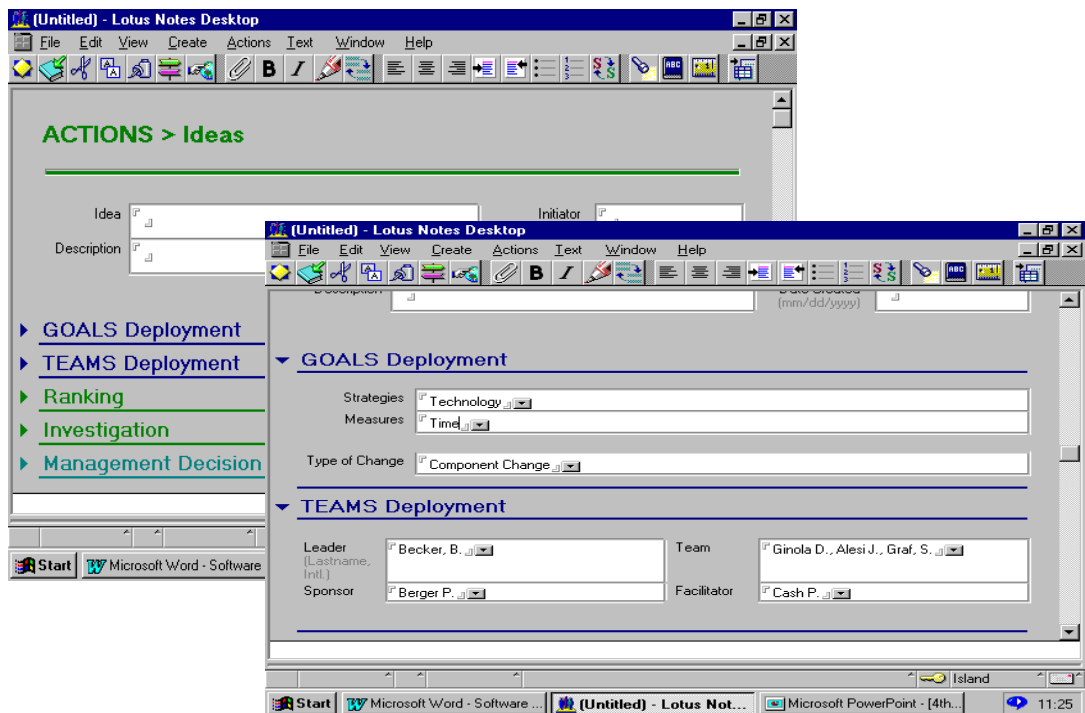


Figure 9: 'Ideas' view of the Actions form

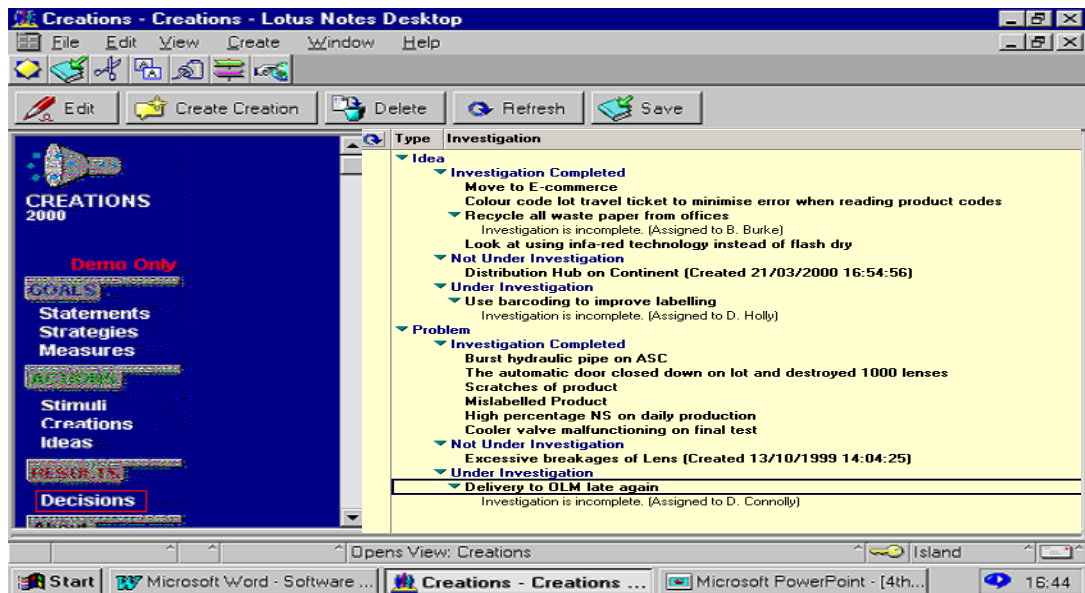


Figure 10: Results View

Methodology	Creative Process (Kao, 1989)	Creations Tool
Environmental Scanning	Interest	Goals (Statements, Strategy, Measures) Actions (Stimuli)
Opportunity Identification	Interest Preparation Incubation	Actions (Stimuli, Creations) Goals Results
Idea generation technique	Incubation Illumination Eureka Verification	Actions (Creations, Ideas) Results Goals Innovation Manager

Table 1: Design Integration