JOURNAL OF ASIA ENTREPRENEURSHIP AND SUSTAINABILITY
REFEREED EDITION - ISSN 1176-8592
EDITORS: ROSEL FONACIER & JENS MUELLER
VOLUME II, ISSUE 2 SPECIAL ISSUE -ACTION LEARNING-

EDITORS@ASIAENTREPRENEURSHIPJOURNAL.COM

The Macquarie Innovation Learning & Knowledge (MILK) Framework.

Sam Burshtein
Senior Lecturer, Macquarie University

Steve Brodie
Senior Lecturer, Macquarie University

Contact Details:

Sam Burshtein
Macquarie Institute for Innovation
Macquarie University NSW 2109 Australia

Tel: +61 2 9850 4803
Fax: +61 2 9850 4802

Sam.Burshtein@mq.edu.au

www.mii.mq.edu.au

The Macquarie Innovation Learning & Knowledge (MILK) Framework.

ABSTRACT

The term Entrepreneurship is generally seen to encompass a relatively broad range of activities and roles, including:

- Self-employment;
- Small business management;
- The establishment of technology-based start-ups;
- Commercialisation of Intellectual Property; and
- Pioneering new ideas and leading transformational change.

Even within these distinct spheres, there is a range of entrepreneurial roles – from providing leadership and strategic vision, through to conduct of day-to-day activities involved in achieving sales revenues and ensuring the venture's solvency. Each of these roles requires a distinct (albeit often overlapping) set of knowledge and skills.

As part of an effort to develop a cohesive set of academic and professional education programs addressing Entrepreneurship and Innovation, our team identified a need for an explicit map of the successful Entrepreneur's knowledge base possessed, and a framework that relates the various ideas, concepts, and skills that comprise such a knowledge base to each other, and to the various roles and functions that fall under the broad rubric of Entrepreneurship.

The Macquarie Innovation Learning & Knowledge (MILK) Framework was intended as a tool that could be used to define and categories the basic units of knowledge and skill that should be part of an Entrepreneurship education program. It seeks to segment relevant knowledge into a defined set of categories (dimensions), with each dimension representing a particular field of specialization. Each category is further segmented into levels of increased complexity and significance – with concepts at each level relying (and building) upon lower level ones for effective comprehension.

This structure is keeping the view of memory as a hierarchical network of conceptual schemas, and Sweller's Cognitive Load Theory, which argues that working memory capacity acts as a constraint on the size of individual concepts (schemas). Learning complex ideas thus relies on having them be expressed as a combination of simpler concepts that have been previously learned.

The current version of the framework defines nine functional dimensions, coupled with an integrative one (strategic perspective) that reflects connections between the other nine. Each dimension was delineated into four levels of complexity – from a basic awareness of the field, through to mastery that enables one to play a leadership role in that area. The resulting model sets out 40 distinct modules of "knowledge", each encompassing a specific set of ideas, skills and capabilities.

The MILK framework enables the explicit definition of a minimum skill set to be expected of staff in specific organizational roles (such as R&D Manager, Business Development Lead, Sales Executive, or CEO). These definitions can then be applied in recruitment, promotion and performance evaluation, as well as being used for determination of professional development and training needs.

The framework is being applied at the Macquarie Institute for Innovation to develop a set of teaching modules that can be assembled into specific education and training programs. This enables the deployment of a teaching model that is comprehensive, robust, and cost effective. The framework also supports a research agenda, with a focus on developing clearer definitions of the content of each module.

"The aim of education should be to teach us rather how to think, than what to think."
– Bill Beattie, "Remarks on the Utility of Classical Learning", 1776

INTRODUCTION – ENTREPRENEURSHIP EDUCATION

The term "entrepreneurship" is generally seen to encompass a relatively broad range of activities and roles, including

- Self-employment and small-business management;
- The establishment of technology-based start-ups;
- Commercialisation of Intellectual Property;
- Launching new products and developing new markets; and (more broadly)
- Pioneering new ideas and leading transformational change.

Within these distinct spheres, there is a range of distinct entrepreneurial roles – from providing leadership and strategic vision, through to conduct of day-to-day activities involved in achieving sales revenues and ensuring the venture's solvency. Each of these roles requires a unique (albeit often overlapping) set of capabilities and skills. Development of such capabilities and skills is the aim of entrepreneurship education.

The Oxford English Dictionary (Little, 1991) defines "educate" as (inter alia) *"...to train so as to develop some special aptitude, taste or disposition"*. The aim of education is thus not simply to impart "knowledge", but rather to inculcate in students certain ways of thinking about their environment and the various problems and challenges they encounter in their lives. This perspective is particularly relevant for entrepreneurship education, where the explicit goal is to prepare students to play an active role in successful entrepreneurial endeavours.

Entrepreneurship education has attracted significant attention over the past decades. However, much of the effort (as well as the bulk of research) in the field has focused on strategies to encourage entrepreneurial behaviour. A representative example is Holmgren & From (2005), who define "Entrepreneurship Education" (citing Sjøvoll and Skåland, 2002) as:

> *"...the process of providing individuals with the concepts, creativity and skills to recognise opportunities that others have overlooked, and to have the insight, self esteem and knowledge to act were others have hesitated ...entrepreneurship also means ... a vision of a future with a lot of possibilities" (p.385).*

In the mid 1980s, a focus of much of the research in the area was personality traits, in an effort to identify and inculcate the traits that predispose people towards becoming entrepreneurs (Greenberger and Sexton, 1988). Over the recent years though, this direction has been discredited, in particular because trait theory does not account for learning and development as entrepreneurs establish and manage ventures (Gartner 1988, Shaver 1995).

Focus then shifted to a behavioural perspective, whereby students were seen to learn to be entrepreneurial by engaging in the various activities involved in the creation of new business ventures (Gartner 1985). The resulting programs involved students in various aspects of new venture creation – from opportunity recognition through to the preparation of business plans – including market research, competitive analysis, and IP strategy (Kuratko 2005). The expectation was that students would learn to become more entrepreneurial.

One example of this approach is Swinburne University's MEI program, which sought to explicitly track whether its graduates became involved in new venture creation. McMullan

and Gillin (1998) reported that some 87% had done so. More generally, many programs began to emphasise "experiential learning" activities like internships, consulting projects, computer simulations, student business start-ups, and interactions with successful entrepreneurs (Kuratko 2005, Solomon et. al. 2002). In some cases, successful completion of such activities became a graduation requirement. Looking beyond the "start-up" stage, Cope (2005) presented a "dynamic learning" perspective, which built upon the "behavioural" one to examine how entrepreneurs learn and develop once the new venture is established.

Factors which encourage entrepreneurship are clearly important, since a willingness to engage in entrepreneurial activity is a basic pre-requisite for doing so. Yet once graduates of such a program have committed to an entrepreneurial career and identified a (hopefully) attractive opportunity as a focus for their efforts, the challenge of transforming this opportunity into a successful venture remains. Thus, there is a need to identify and organise the particular insights, knowledge, and skills that will enable aspiring entrepreneurs to succeed in their endeavours.

Most entrepreneurship education programs emerged from conventional business and management programs, and reflect an attempt to repackage the functional elements of such programs to focus on smaller enterprises. While many of these elements are relevant and significant, it is widely recognised the behaviours, knowledge and skills associated with management of established enterprises need to undergo significant adjustment to be relevant in a context of emerging initiatives.

This paper presents a framework for thinking about the skills and knowledge involved in entrepreneurial activities, and for developing entrepreneurship education programs that focus on the acquisition of such knowledge and development of relevant skills.

DEVELOPING A MODULAR ENTREPRENEURSHIP EDUCATION PROGRAM

The Macquarie Innovation Learning & Knowledge (MILK) framework was formulated at Macquarie University's Macquarie Institute for Innovation (MII) in the context of an effort to develop a suite of education and training programs in Entrepreneurship and Innovation (with a particular focus on technology-based entrepreneurship).

MII's educational mandate encompassed the delivery of undergraduate and post- graduate academic course units (including a dedicated "Masters" degree), research commercialisation training for the University's research students and staff, commercially available short courses that address issues related to management of technology start-ups, and custom training programs in the area technology commercialisation and innovation management.

To leverage scarce time and staff resources across this broad range of educational offerings, the MII team sought to develop the educational content of its programs as a set of re-usable modules, each addressing a distinct area of knowledge or capability. These modules could be assembled as required to provide a broad variety of programs to meet specific demand.

Context: Defining the Framework's Scope

In developing the MILK Framework, the MII team sought to address a diverse set of objectives, including:

- Detailing the diverse base of knowledge that could be expected to significantly improve the success prospects of entrepreneurial ventures;
- Providing an organized map of content that should comprise educational programs in the "Entrepreneurship" sphere (including programs focused on research

commercialisation and management of innovation), highlighting dependencies between the various concepts;
- Reflect a hierarchy of understanding and capability, in line with differences in the level of knowledge, skill development and experience;
- Organized into distinct modules of information, each of which of a size that could be delivered in one to two days (10-12 contact hours) of teaching;
- Usable as a guide for program development;
- Usable as an assessment tool to evaluate existing skill/capability sets;
- Be easy communicable to a general audience.

The framework would be used both to organize and structure program content, to define the specific skill and training requirements that would be addressed in "custom education" programs, and as a tool to identify and clearly communicate skill and training gaps to client training managers and prospective students.

One communication approach seen as an attractive example was the well known Bell-Mason diagnostic (Bell and McNamara, 1991). Developed as a framework for evaluating the prospects (and investment potential) of early-stage technology ventures, it defines a set of performance dimensions, a methodology to evaluate the level of development along each dimension achieved by the particular venture, and a set of "targets" that a venture should meet as it develops from the "concept" stage to a "steady state".

In developing the MILK framework (as well as the actual programs that apply the framework) particular emphasis was given to current learning and skill development theories, in particular the implications of recent developments in understanding Human Cognitive Architecture on the processes involved in learning and teaching complex concepts and skills.

HUMAN COGNITIVE ARCHITECTURE AND THE COGNITIVE LOAD THEORY

One effort to understand how people acquire and apply knowledge and skills (in other words "learn") is the Cognitive Load Theory (CLT) proposed by Sweller (1999). CLT seeks to apply the principles of psychology and cognitive theory to better understand the processes involved in learning and teaching. The key theme of CLT is that to be effective, instruction must take account of human cognitive architecture, and the way people acquire and organise knowledge.

Human Cognitive Architecture

Human ability to learn, to acquire, retain, and retrieve information, and eventually to apply it in a proper context, relies on the operation of our memory. CLT proponents (building upon the substantial body of research on "memory") argue that human memory comprises three distinct functional units:

- ***Sensory Memory*** – where the external data impinging upon our senses is translated into individual elements of meaning, such as shapes or sounds;
- ***Working Memory*** – where such individual elements and/or the relationships between them are identified and/or classified for immediate decision making.
- ***Long Term Memory*** – where information about information elements and relationships between them is retained over an extended period – in other words, "learned".

These three functional units, and the channels that enable the transfer of information between them (Figure 1), comprise Human Cognitive Architecture (HCA).

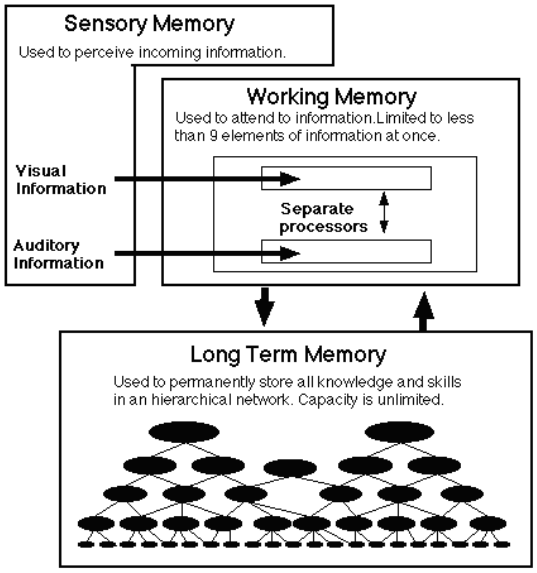

Figure 1: Human Cognitive Architecture (Cooper, 1998)

The structure and operation of HCA influences the process of knowledge acquisition (or "learning") as well as the subsequent application of that knowledge ("capability" or "skill"). Of particular significance are the different structures and function of Working Memory and Long Term Memory, as well as the relationship between them.

Knowledge acquired over our lifetime is organised into complex relational structures termed *schemas* (Rumelhart, 1980) which are stored in Long Term Memory (LTM). Each schema, consisting of a set of "information elements" and a description of how they relate to each other, defines a "concept". Schemas can be thought of in terms of a network of associations between mental "representations" for disparate concepts. This reflects the "Connectionist" or "neural network" view of cognition, which sees the learning process as involving the creation of connections between the brain's neuron structures and changes in the strength of such connections. Hebb (1949) described this as "*neurons that fire together wire together*". Thus, we "learn" the association between one abstract concept (like "heat" or "profit") and another (like "fire" or "high priced sale"), and that if the later is created, the former is likely to ensue.

However, though LTM is an effective storage mechanism, having virtually unlimited capacity and retention, the actual use and manipulation of information relies on the Working Memory (WM). WM contains "processors" which enable us to deal with the various units of data that impinge upon our senses: identifying specific information elements and how they interact with each other and previously learned concepts or schemas, assembling diverse elements of information into a cohesive unit (the new schema), and integrating the resulting unit of "knowledge" into our overall base of knowledge (thereby creating "meaning" and "capability").

Cognitive Load Theory

Research suggests, that processing capacity of WM is limited, with most people able to manipulate just 7 to 9 information elements (or relationships) in their WM at a time (Miller, 1956). The limited capacity of WM in turn limits the complexity of the concepts (or schemas) we can readily manipulate.

If we define the term "Cognitive Load" to describe a concept's "size" (in terms of the number of distinct elements and/or relationships that comprise that concept's schema), it follows from

the above that the difficulty of learning a particular concept is directly related to its "Cognitive Load". Specifically, for a concept to be learnable, its "cognitive load" must be smaller than WM capacity. To the extent that the full schema for a concept may exceed WM capacity, we rely on a related cognitive mechanism.

With very few exceptions, complex schemas comprise of elements that are themselves schemas – thus the schema for "snow" is made up of schemas for ideas such as "white" and "cold". Once we have fully learned a schema, it can serve as a substitute for all the elements that comprise it. Thus, the cognitive load of a complex schema can be reduced by decomposing it into a set of simpler sub-schemas, each of which is smaller than WM Capacity. For example, understanding that Net Present Value represents the "economic profit" available in a non-competitive environment, makes it easier to understand "competitive strategy" models. Likewise, when we attempt to apply a complex concept, understanding it well enables us to isolate a small subset of the complete schema for manipulation in WM, and then to integrate the results of such "manipulation" with other sub-schemas to obtain the overall result.

Thus, the schemas stored in LTM are organised as a hierarchical network, building up from simple definitions of shapes and sounds to abstract concepts such as fairness, strategy, "value", or "the theory of relativity". This is also the way we learn (in other words acquire new schemas), by assembling more complex (higher order) concepts and skills from less complex (lower order) building blocks.

Applying Skills – Schema Automation

Developing proficiency in a field thus requires the development of a dense network of schemas that reflect the various concepts, principles, ideas, rules, and cause-effect relationships in that field. The difference between a "novice" and an "expert" in the particular field though, reflects more than just the number (and relevance) of the schemas in their LTM. We are all familiar with people who are able to memorise (or "rote learn") sophisticated concepts, but lack the ability to correctly apply them in the "real-world" environment.

Cognitive Load Theory addresses this issue by recognising that there is a further, distinct aspect of the learning process – *Schema Automation*.

When presented with a new problem or task, prior to applying the appropriate schema(s) we need to classify the problem – relate it to one or more of the numerous schemas that comprise our LTM. The amount of effort needed for this "classification" task is a key differentiator between the "novice" and the "expert". The novice needs to search through the various available schemas to identify the ones that are relevant to the task at hand, and then to figure out exactly how to apply the chosen schema. The key characteristic of an "expert" is that this process takes place automatically, without conscious effort or additional "cognitive load" (enabling the "expert" to apply more complex schemas more effectively).

Schema automation does not involve creation of new mental frameworks (or "neural connections"), but rather the adjustment of the strength of the existing links between LTM schemas in order to make the newly learned schemas more accessible.

CLT and Entrepreneurship Education

The key implication of the CLT model is that learning involves two distinct processes: *Schema Creation* and *Schema Automation*. This implication can serve to guide our efforts, dividing high-level goal of "*helping students develop the capabilities needed to build successful entrepreneurial ventures…*" into two distinct tasks:

- help students formulate a conceptual framework (set of schemas) that defines a set of complex concepts (such "build a successful venture", "attract talented people" and "credible value proposition") and the relationships between these.
- provide students with the opportunity to practice applying key schemas, so as to strengthen the particular associations considered important (e.g. between "superior value proposition", "defendable market", and "sustainable profits").

The first of these tasks requires the teacher to formulate a hierarchy of concepts. This hierarchy would offer guidance as to the order in which the more "complex" concepts should be learned (and thus taught), thereby enabling these complex ideas (or "skills" or more fundamentally "associations") to be presented in readily comprehensible (and thus learnable "chunks").

An effective hierarchy must encompass the dependencies both within a particular subject area (such the need to conceptualise "profit" in order to understand "return on investment") but also across subject areas (such the need to understand statistical concepts as "normal distribution" and "co-variance" order to understand financial "risk premium" models).

The second of these tasks requires the teacher to relate the abstract concepts to real life examples, and to provide students with the opportunity to practice their skills in a controlled environment, using "active learning" methods such as case studies and applied projects.

The MILK Framework

In attempting to formulate and classify a "*body of knowledge*", there is a clear need for boundaries to limit the task's scope to manageable proportions. In the context of "entrepreneurship" this is particularly challenging, as the term is seen to have a range of disparate meanings and applications, encompassing not just business creation, but also the creation of innovative non-profit ventures, leading transformative change in established organizations, and "initiative" generally.

It is seen that since most such "entrepreneurial" initiatives will eventually need to secure resources, access to which is (in Western countries) typically controlled by the market, a key element of an "Entrepreneurship Education" program must comprise business related skills. Reflecting this, the dimensions that comprise the framework have a strong association with business education.

In segmenting relevant knowledge into a defined set of "knowledge categories" (dimensions) with each dimension representing a particular field of specialization, ten dimensions were chosen. The first nine reflect particular areas of specialisation, with the tenth serving to integrate the concepts of the other nine into a cohesive whole.

The Specialty Dimensions:

The nine specialty dimensions were selected as:

(1) ***Money*** – This dimension addresses the function of "money" in the commercial environment, both as a unit of measure and as a fundamental requirement for securing necessary resources.

At the introductory level it encompasses basic accounting and finance concepts (such "what is profit" and "discounted value"), though to more complex ("higher order?") concepts related to skills such as being able to raise funds in the public markets (through an IPO or by securitising anticipated cash-flows).

(2) ***People & Organisations*** – encompasses various ideas, skills and concepts related to understanding, managing, motivating, and leading people.

In includes basic principles of "organisational behaviour" such as personality models, teamwork, or motivation and incentive systems through to concepts involved in organisational design, tacit knowledge, organisational learning, job structuring, recruitment, HR policy, and related issues.

(3) ***Value Creation and Marketing*** – to the extent that our "market" system is built upon the "free exchange of value", and "value creation and capture" are seen as the primary goals of entrepreneurs, this module addresses the very concept of "value" and how "value" is created in the market place.

Building upon the "Marketing" discipline, this dimension looks at how "value" is defined and measured, various aspects of customer demand and satisfaction, issues related to product and service design, collection of market data, quality management, and pricing strategies. At higher levels, strategic concepts such as role of industry standards and market externalities such as network effects are considered.

(4) ***Competition*** – while the above dimension focuses on the issues related to the "creation" of value, this one addresses those related to the capture/retention of such "value" in a competitive environment. The focus is on how value (or in the first instance revenues) is distributed amongst various stakeholders associated with the enterprise.

Concepts and models addressed include basic theories of competitive strategy (such Porter's 5-Forces model) through to strategies that involve control of key resources or preferential access embodied in industry standards or legislation, and on to issues related to corporate governance and social responsibility.

(5) ***Ideas and Paradigms*** – most definitions of "entrepreneurship" consider it to be inextricably linked with "innovation", the emergence and adoption of productive new ideas.

This dimension focuses on this "innovation" process, including models of idea creation, dissemination, and diffusion, product and industry life cycles, role of "dominant designs" and paradigms, and ideas such as "path contingency".

(6) ***Analytics*** – encompasses analytic tools and frameworks, from basic statistical concepts such as measures of central tendency and variance, the implications of different distributions, hypothesis testing, and forecasting.

In the advanced stages, this dimension examines issues related to rationality, cognitive biases, as well as analytic techniques such as simulation.

(7) ***Selling & Communications*** – focuses on skills and capabilities related to sales and persuasive communication, including presentation skills and negotiations.

At advanced levels, this dimension examines related to organisational decision processes, sales-force management, rhetoric, and determinants of behavioural change.

(8) ***Execution*** – addresses the various issues related to effective execution in a business setting, including financial controls, project management, the role of IT, production, operations management, time management, etc

In the advanced levels addresses issues related to design of optimal business processes, management of information flows, outsourcing, effective planning, and effective use of IT based management systems such as ERP and CRM.

(9) ***Law and Governance*** – focuses on the legal infrastructure in which business (and other) ventures operate, including various tax and reporting obligations, laws, related to protection of Intellectual Property, those designed to regulate competition, and those

that govern the relationship between entrepreneurs, managers, investors, and employees.

The Integrative Dimension: Strategic Perspective

Although the above dimensions reflect an effort to segment knowledge into distinct fields, in the real world segmentation of this sort is neither effective nor fully desirable. Effective entrepreneurs must be able to effectively integrate the knowledge from each of the specialty areas ("dimensions") into a cohesive understanding of the actions that need to be taken to enhance the venture's prospects of success.

The final "integrative" dimension, "Strategic Perspective" serves such a role, offering links between the concepts in the various modules. Notably, many of the concepts that comprise this dimension leverage the concepts and schemas developed in the other dimensions – if studied independently their "cognitive load" would be excessive.

Thus (for example), understanding the proprietary control of an industry standard is a competitive advantage that can underpin superior profit margins and valuation (Morris and Ferguson 1993), requires understanding aspects of "Value" (Axis 3), "IP law" (Axis 9), "Competition" (Axis 4), and "Profitability and Margins" (Axis 1).

The ***Strategic Perspective*** dimension focuses on concepts that integrate ideas, skill, and knowledge from multiple other dimensions. In this respect it can be seen as the most important dimension – as it enables the effective application of the more complex concepts in a "real world" environment, a critical aspect of "expertise".

Levels of Expertise

Knowledge/capability in each specialty area ("dimension") is seen as organized into levels of increased complexity and significance: with higher level concepts building on the lower level ones for comprehension.

To reflect this, complexity was delineated into four levels. The designation (naming) of each level was chosen to provide some guidance as to what may be expected at each level of understanding – from basic familiarity through to the ability to play a leadership role in that area. In particular, the four levels were designated as:

1. Awareness – knowledge sufficient to understand the field's basic terminology and to be able to follow clear instructions in respect of activities in the field;
2. Involvement – sufficient knowledge to be able to work effectively in the field as a member of a team or independently on clearly defined tasks;
3. Execution – understanding and ability to lead small teams in execution of well defined projects in the field, having clear guidelines in respect of objectives resources, and processes;
4. Leadership – knowledge and capability sufficient for independent leadership of key functions or (with sufficient breadth of skill and experience) the entire enterprise.

Segmenting the skills and capabilities associated with successful Entrepreneurship and Innovation activities into 10 areas (dimensions) of specialisation, each with four levels of expertise (or complexity) results in 40 distinct "knowledge" modules.

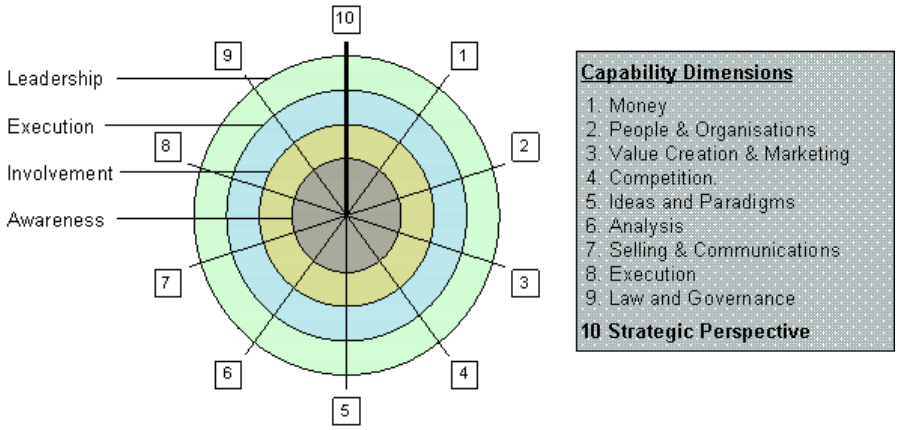

Figure 2: The MILK Framework

These can be represented on a "Radar Diagram" (Figure 2), where each intersection of the specialty axis and the complexity circle represents a specific module.

APPLYING THE MILK FRAMEWORK

In essence, the MILK Framework provides a tool for categorising and organising the various cognitive schemas that can be seen to comprise the "knowledge base" of an "Entrepreneur". It can thus be applied either normatively, to describe the knowledge base of a particular person, or positively, to prescribe job requirements or the content of educational programs. It can also serve to identify (and readily communicate) gaps between a person's knowledge base and the role's requirement, highlighting training needs.

Organising Concepts and Schemas

Perhaps the best way to present this function is by example, describing the content of an example set of modules and the hierarchical relationship between the concepts (or schemas) that comprise each module. In this regard, we can examine Levels 1 and 2 of the "Money" dimension, and how the contingency effect of Level 1 "Analytics".

Module: Money [1]

This module comprises the most fundamental concepts of accounting and finance, as they impact the emergence and development of a new venture. The emphasis in on understanding:

- Money as a resource to fund the asset base needed to support the venture's growth. Particular emphasis is given to the "fundamental accounting equation" (A = L + OE), which highlights that funding for the venture's assets needs to be provided either by the entrepreneur him/her self or by external investors;
- The role of accounting statements a key source of information about the flow of resources in the business, in particular for cost calculations, and the role of leverage (both "financial" and "operational");
- Importance of cash, and the difference between cash and accrual accounting;
- Key financial ratios (particularly "investor return" metrics like ROI and ROE), and the subordinate metrics that drive these (DuPont ratio decomposition);
- Introduction to "time value of money," including discounted cash flow analysis and key DCF formulae like "annuity", "perpetuity" and "growing perpetuity".

Upon completion of this module, students should understand the function of money in a start-up venture, and recognise its impact upon key decisions.

Module: Money [2]

This module build upon "Money [1]" to introduce concepts related to risk, valuation, and efficient use of scarce resources. In includes concepts such as:

- Different definitions of risk, including degree of variance from expected return, default risk, and risks in timing of cash-flows;
- The impact of diversification on risk, and in particular the differences between unique and market (systematic) risk;
- Managing risk with arbitrage, capital structure adjustments, and derivatives;
- Introduction to asset pricing models such as CAPM and APT, and the key assumptions embedded in such models;
- Implications of the "diversification," "fungibility", and "liquidity" assumptions on valuation of entrepreneurial ventures;
- Valuation in the absence of information – the venture capital approach.

Upon completion of this module, students should understand the factors that can influence the value (and fundability) of their venture, and be aware of some ways to manage risk.

However, since many of the "risk" and "risk management" models presented in this module rely on "statistical" metrics of "risk", to effectively understand (and thus learn) these models, the student must understand some of the fundamental statistical ideas (including the characteristics of the "normal" distribution, "Expectation", and "variance and co-variance" which are presented in Level 1 of "Analytics". As such, familiarity with Analytics-1 should be a pre-requisite for study of Money-2.

Module: Strategic Perspective [1]

While understanding the role of money and the various financial models is important in a business environment, complete understanding requires that it be linked with the other dimensions of knowledge. The strategic perspective dimension helps students to understand that superior profits stem from an ability to create superior value ("Value Creation") in an environment of constrained competition ("Competition") which will allow the entrepreneur to retain the bulk of the created value.

Reflecting the view that no knowledge is ever fully acquired until the student is able to apply it in such a "real world" environment, the MILK framework as proposed requires that when evaluating people for leadership roles, only skill levels less than or equal to one's capability along the "Strategic Perspective" dimension be considered.

Using the MILK Framework for Evaluation and Communication

As well as defining the contingency structure of the various schemas that make up the cognitive "knowledge base" of an entrepreneur, the MILK Framework can have substantial value for testing and evaluation, and as tool to set out and communicate the capability requirements of specific organisational roles.

Once all of the modules are fully specified in respect of the schemas (concepts, ideas and skills) that comprise them, instruments could be developed to evaluate the knowledge base of current (or prospective) staff in order to identify training needs.

Similarly, various roles in the enterprise could be expressed (and defined) in terms of the specific modules of knowledge that should form part of an incumbent's "body of knowledge". Thus (for example) a "Sales Manager" role may require the incumbent to have Selling-3 and People-3 (with Strategic-2 as a pre-requisite) and Execution-2, with Level 1 in all remaining categories. Since the framework enables both of the above sets of information to be presented

in a convenient graphic form, superimposing the two "capability maps" would readily allow a candidate's suitability for the role (and training gaps) to be readily perceived (Figure 3).

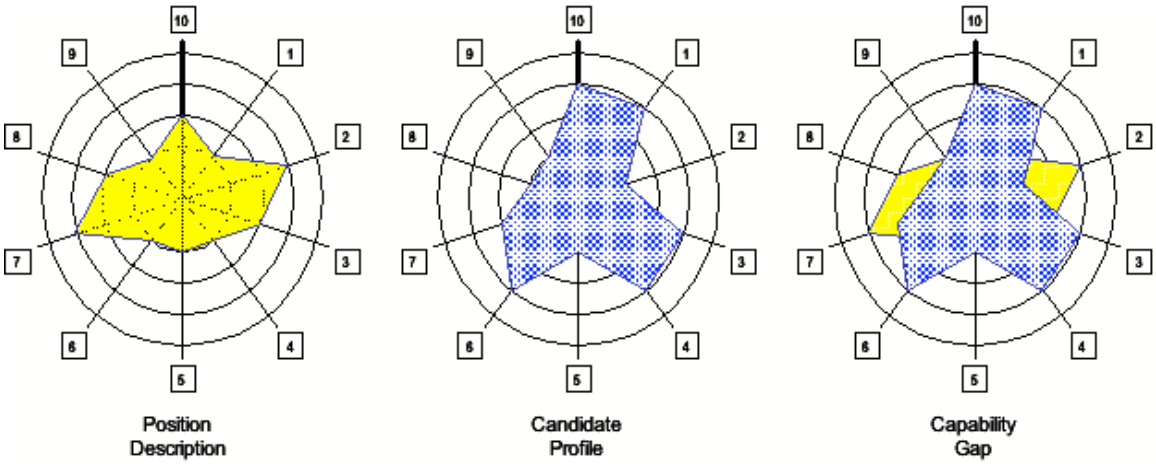

Figure 3: Using the MILK Framework for Recruitment.

Excess skills in a particular area could provide guidance on areas of interest and thus career paths, whereas any gaps (relative to either current or aspirational roles) would indicate training needs. This, in the above example, the candidate appears to be well suited for a "strategic marketing" role.

Finally, career paths could be defined in terms of skills that need to be acquired for a particular promotion –highlighting for example, that the move from salesman to sales manager requires "Execution (3)" level skills in "[7] Sales & Communication" while to become a marketing manager requires attaining that skill level in "[3] Value Creation & Marketing" (with both requiring "Execution [3]" in "[2] People & Organisations").

CONCLUSION AND FURTHER DIRECTIONS

The MILK framework remains in early stages of development, with current application limited to its use in designing a custom "research commercialisation training" program for a semi-government research institution.

The focus of current work is the development of detailed outlines of the content of the individual modules, and a comprehensive map of the relationships and dependencies between the concepts ("schemas") that comprise each module. In particular, there is a need to explicitly decompose complex concepts into simpler schemas that can be accommodated (and manipulated) within Working Memory capacity.

Another research direction focuses on ways to apply the framework as diagnostic tool in evaluating capabilities and performance, and for HR applications such as position descriptions for recruitment and training needs assessment.

The development of the MILK framework progressed in parallel with the development and delivery of the actual innovation and entrepreneurship education programs at the Macquarie University. Throughout this process, the framework informed the structure of the curriculum and delivery of classes. Reciprocally, the framework benefited from comments arising through interaction with corporate clients, and from feedback from practitioners and other

educators in the field. We encourage the readers to consider the MILK framework, and welcome any comments regarding its conceptual structure and practical implementation. In particular, we welcome suggestions in regard to the specific concepts that should comprise the content of the individual modules from educators across a broad range of specialties.

ACKNOWLEDGEMENTS

The authors gratefully acknowledge the contribution of National ICT Australia Limited (NICTA) whose staff provided inspiration for some of the concepts and ideas that are developed and presented in this paper.

REFERENCES:

Bell CG and Mason H (1998), "The Care and Feeding of 'Intrapreneurs'," *Context Magazine,* Spring, Diamond Cluster International: USA.

Bell CG and McNamara JE (1991), *High-Tech Ventures: The Guide for Entrepreneurial Success,* Addison-Wesley: Reading, MA.

Cooper G (1998), *Research into Cognitive Load Theory and Instructional Design at UNSW*, UNSW http://education.arts.unsw.edu.au/CLT_NET_Aug_97.HTML

Cope J (2005), "Towards a dynamic learning perspective of Entrepreneurship", *Entrepreneurship: Theory & Practice*, July, 29(4):373-397.

Gartner WB (1988), "Who is an entrepreneur? Is the wrong question", *American Journal of Small Business*, 13(1):11-32.

Greenberger DB and Sexton DL (1988), "An interactive model of new venture initiation", *Journal of Small Business Management*, July, 26(3):p1-7.

Hebb DO (1949), *The Organization of Behaviour*, John Wiley & Sons, New York.

Holmgren C and From J (2005), "Taylorism of the Mind: entrepreneurship education from a perspective of educational research", *European Educational Research Journal, 4(4)*

Kuratko DF (2005), "The Emergence of Entrepreneurship Education: Development, Trends, and Challenges", *Entrepreneurship Theory and Practice*; 29(5):577-597.

Little W (1991), *The Shorter Oxford English Dictionary*, 3ed, Oxford: UK, p.630.

McMullan WE and Gillin LM (1998), "Industrial Viewpoint – Entrepreneurship Education", *Technovation*, 18(4):275-286.

Miller GA (1956), "The magical number seven, plus or minus two: Some limits on our capacity for processing information", *Psychological Review*, 63:81-97.

Morris CR and Ferguson CH (1993), "How Architecture Wins Technology Wars," *Harvard Business Review*, Mar-Apr:86-96.

Rumelhart DE (1980), "Schemata: The Building Blocks of Cognition", In RJ Spiro, BC Bruce, & WF Brewer (Eds.), *Theoretical Issues in Reading Comprehension,* Hillsdale, NJ: Erlbaum, pp. 38-58.

Shaver K (1995), "The Entrepreneurial personality myth", *Business and Economic Review,* 41(2):20-23.

Solomon GT, Duffy S, & Tarabisy A (2002), "The State of Entrepreneurship Education in the United States: A Nationwide Survey and Analysis", *International Journal of Entrepreneurship Education* 1(1):1-22.

Sweller J (1999), *Instructional Design in Technical Areas*, Australian Council for Educational Research: Melbourne.