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Concepts in Innovation and Change

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Chapter 6: Life-cycles and Systems

"Kant was right: our theories are free creations of our intellect, which we try to impose upon nature. But we are only rarely successful in guessing the truth; and we can never be certain whether we have succeeded. We must make do with conjectural knowledge." – Karl Popper, 'In Search of a Better World'.

Introduction

It is the central idea of this book that most things can be thought of as *dynamic systems* – that is, as groups of related elements that are purposeful and appear to change over time in a fairly orderly way. In the case of living things and organisations, these changes occur within the one identifiable 'body'; in artefacts the changes occur within the 'envelope' of the 'same' invention – as we discussed in the previous chapter on *performance curves*. The broad features of this evolutionary change can be compared with the growth stages of living systems. That is, new systems are initially created from existing systems and sub-systems, and then they emerge from a formative stage to undergo rapid growth, stabilise, mature and become very complex and eventually decline, sometimes after undergoing a brief stage of revitalisation.

The earlier stages of pre-life and invention and the latter stages of revitalisation and decline in this process, which weren't depicted in the simple performance curves of Chapter 5, are seen to be a crucial part of a complete analysis.

Business management gurus and technological change analysts have used *life-cycle* models for many years and although they usually point to the broad similarities between the way that products ('artefacts'), organisations and living things change, very few have ever tried to develop the model in any detail. They often claim that the model lacks sufficient predictive capacity to be useful beyond the initial notion of a life-cycle. In this book we argue otherwise.

At this stage the life-cycle model lacks a unifying theoretical foundation – after all, why *should* widgets and companies (and even civilisations) conform to the same patterns of change as humans and hamsters? Nobody knows the full answer to that question, although it seems that the further we explore the science and mathematics of [complex systems](#)¹, the more like living systems they become. For the purposes of this book we will show that the verisimilitude of the life-cycle is very extensive and at least it is a very powerful analogy.

To see the extent of these similarities, we need to first look more closely at *living systems*. In the following section we will review the idea of a life-cycle as we experience it, firstly without recourse to the language of systems.

The way in which these systems structures are reflected in the behaviour of workers and management will be discussed in Chapter xxx.

Life-cycle – Be In It!

The cyclical nature of life has been recognised by all cultures and has been embodied in all religions for all of recorded history, and undoubtedly earlier. For example, in Christianity, life is, in summary, *ashes-to-ashes and dust-to-dust*; in Hinduism it is *Brahma, Vishnu and Shiva* (birth, continuance and destruction); and in Buddhism, it is *Mahayana*, the wheel of life. In France (if the French way of life could be called a religion) one is an *entrepreneur*, a *bricoleur*, or a *demolisseur*. And so on. And out of the ashes and contradictions of the last life rises the new life.

Analysing the life-cycle is a common habit in our society. Artists, writers and technologists often use the idea of ‘the seven ages of man’ for convenient categorisation. Photographers and demographers, educators, medical practitioners and specialists of all kinds dissect our life span into similar temporal segments.



Fig 6.1: Anglicus Bartholomaeus, from 1486 AD. An illustration of the various life stages of man, as would later be depicted in William Shakespeare's, *As You Like It* - Act II, Scene VII as the "seven ages of man".

Most of these analyses seem to be somewhat incomplete, particularly as too little attention is given to ‘life-before-life’ and to mid-life, when rejuvenation is attempted. The following *eight-segment* life-cycle, which I have developed, appears to address the whole cycle quite comprehensively. Each stage is given a name.

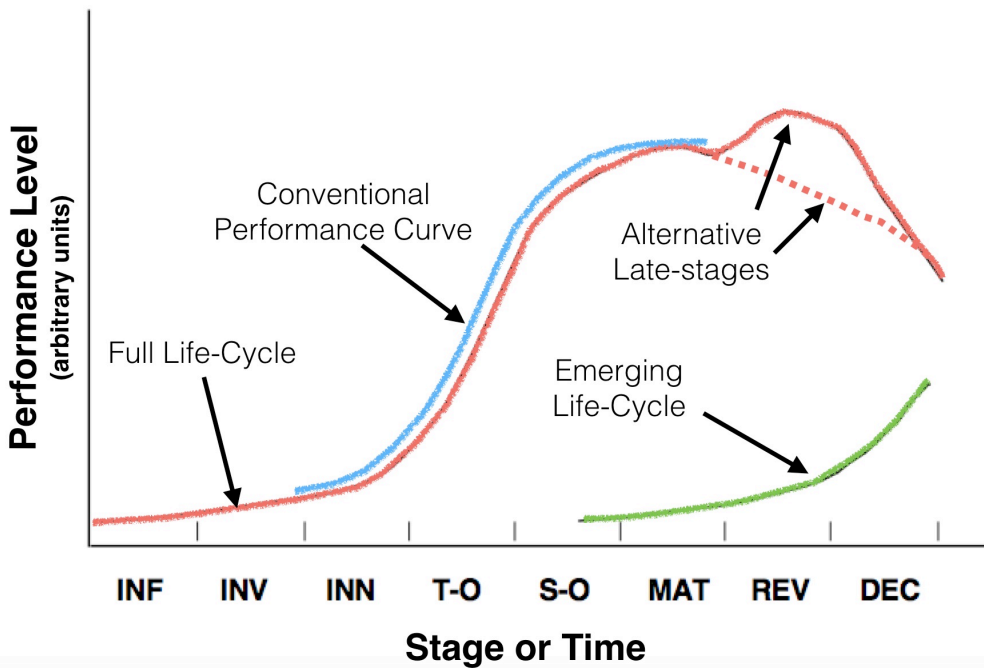


Fig 6.2: Generic depiction of a life-cycle, showing the eight stages used throughout the text (red). The blue curve shows the usual extent of a conventional performance curve, which does not include the early and later stages. The dotted red line shows the path of a life-cycle that declines without attempts at revitalisation. The early stages of an emerging life-cycle that is likely to replace the red life-cycle are also shown (green).

Stage 1 – Information: Life, in its seminal form, can be thought of as a lot of free – floating packages of *information*. It is *pre-life*. That is, the life whose cycle we are talking about does not yet exist as in independent, identifiable form – it is just genetic information (DNA) in the bodies of its prospective parents, or information and ideas in the wider environment in which it will live. Despite its non-existence, most of the basic building blocks for the new life are already in place, with only a few minor combinations of blocks yet to be determined. As well as the seed in their loins, the *idea* an independent life may already exist in the minds of the parents. They have *pre-conceptions* about how the child will be raised and what it will become – some of these ideas are instinctive, and some are the attitudes that they have formed from their own life-experiences. Beyond the parents, there are siblings, extended family, neighbourhood and city, as well as the rest of the world – and some say even the stars – already waiting to influence this new entrant to the earthly life-cycle.

Although this is obviously a particularly important stage of development of life, life-cycle theorists, who usually start their analysis from the moment of birth, often overlook it. They ignore what most people know – *that the quality of the vessel depends on more than the clay from which it is made*. The potter, the kiln, the clay and the fire are all important.

Stage 2 – Invention: At some mystical moment, beyond the understanding of many, genetic information fuses and a new life is conceived – a *novel combination*. At about the

same time, the essential *idea* of the person is also conceived. As well as expectations about the shape, size and colour of the child based on genetic attributes, parents usually have some vision of the kind of *person* that their child will be. That is, they posit with the yet-to-be-born child a sense of yet-to-be fulfilled *purpose*. Interestingly, the Chinese consider that people are one year old when they are delivered into the world – which is technically closer to reality than the Western custom of dating the child from birth. From the moment of conception, the new life-form is subject to many influences – physical, chemical and psychological – some deliberate and others accidental, which will shape and modify its basic being. By the time of parturition (physical birth), *nature* and *nurture* have been interacting with the new life-form for almost a year, and thus setting the foundations for the lifetime to come. The *birth certificate* is an explicit statement of the *existence*, but not the *autonomy*, of the person.

Stage 3 – Innovation: After birth, the child is subject to the rigours of life in the open world. In the early stages after birth, the child is hardly identifiable as separate from the mother, relating to her almost continuously – either feeding at her breast, being cleaned, cared for, cuddled and played with, or sleeping in her arms. With time, the father, and perhaps siblings are included in the interactions. These relationships guide and form infants into functioning humans, eventually capable of physically independent existence, and perhaps intellectual, spiritual and moral autonomy as well. Building relationships with the parents is a slow process, and along the way the parent's hopes, aspirations and values are imparted to the child. The process of parenthood is facilitated by formal and informal information from the wider environment, as well as the parents' own innate knowledge, instincts and prejudices. With time the child's environment includes more and more influences, and the parents' actions and opinions matter less and less. What starts out as the parent's vision of their child slowly transforms into the child's own feeling or vision of what and who they are, and what their purpose is in the world. The child's sense of purpose is an amalgam of both these external influences and its own personal, internal interpretation of the meaning of life.

Stage 4 – Take-Off (or Diffusion): Adolescence is the period of extraordinarily rapid development where both the physical and mental capabilities of the youth are tested to the full in the wider world. It is a time of total turmoil, conflict, competition, and sometimes delight. The role of parents shift from central to marginal, as more and more information is gained from elsewhere and decisions are made without direct reference to them. Important, however, are the parents' influences on the youth from the preceding years. Although essentially alone in the world, the youth is guided, for good or evil, by his or her upbringing. A *personal* sense of purpose begins to emerge, and is tested and contested. Numerous independent experiments with the environment are performed, sometimes successfully, encouraging wider exploration of ideas and relationships, and other times with embarrassment or failure, forcing the youth to narrow his or her horizons. Unexpected talents emerge, and promising potential may fizzle. Progressively, the youth becomes identified as an independent being, responsible for their own actions, and recognised for their abilities, strengths and weaknesses and potential value of their contribution to the community. As the youth steps out into the world they are either

embraced by it and flourish with many and varied relationships, or is rejected and become introverted and wimpish.

Stage 4 – Shake-out: The halcyon teenage years of infinite exploration and seemingly endless energy and personal growth ultimately begin to slow with the sober realisation of adulthood. There is often a crisis of identity, where the young adult reacts to the values of his or her parents and finds that they are now essentially alone in the world. Their physical and mental foundations are now in a recognizably final form, and a crystallization of purpose occurs. Further growth will usually be on these foundations, rather than changes to the foundations themselves. The bewildering array of possibilities for self-expression narrows, as mutually exclusive relationships are chosen, leading to dominant themes in life. One field of study crowds out others, schoolyard friendships and whirlwind romances give way to a range of steady partnerships, and spiritual paths diverge too far to be bridged or held simultaneously. Despite estrangement from parents, and although independent in the legal, social and perhaps financial sense, there is still strong echo of the parent in the child. The child's parents' basic task is now essentially completed.

Stage 6 – Maturity: Chosen options now become commitments and responsibilities. The journey down the long and winding road of adulthood begins and dominant themes reach full expression. This, our parents inform us, is the *true* reality, although doubts may linger. To career, are added marriage, children, possessions large and small, a core of firm friendships, and an ever-growing number of acquaintances of all kinds. Some degree of success is attained in one's professional and social role. Passion for one's partner gradually subsides into care and comfort. The children start growing up and the parents are obviously growing old. As the temples begin to grey, there seems to be a place for everything, and most things in their place. The patterns and cycles of life begin to emerge. At first this brings confidence and the fruits of early training and experience. However, as the seasons continue to go 'round and 'round, confidence gives way to the boredom of routine. Possessions, both physical and mental begin to accumulate beyond our capacity to use them. Some are given away, but attachment to many possessions is too great, and they are sent to the attic of our house or mind. Personal performance now fluctuates within a narrow range. Some friends die prematurely – as do some friendships – as personal differences become irreconcilable. Life is essentially orderly, but increasing effort is required to maintain that order. More and more matters defy practical solutions. Parents die, leaving no spiritual buffer between one's self and the grave. At last the youth has 'grown up', and despite the rather grey view painted here, most people can usually manage a burst of adrenalin and a bit of fun when the occasion warrants it. It's a long haul through the years of responsibility. However, most people, once they 'settle down' want to be as vigorous as possible for long as possible. Change is now relatively slow and subtle. We still annually resolve to get fitter, while watching our waistlines bulge and a new generation emerge.

Stage 7 – Revitalisation: Although for many, life creeps at a petty pace towards a dusty death, modern health and welfare and social norms have brought opportunities for many to recapture their lost youth, or, in some sense, to start over. There is an opportunity to be parent, adult or child again and get back on track. Mid-life crises and menopause have been

the traditional instigators of fundamental changes in late-maturity. Now, early retirement of some kind from 'the firm' is increasingly common, and a new career, starting in one's fifties is possible, rather than slugging it out until 'retirement' and then just going fishing or watching TV from the rocking chair. It is an opportunity to slough off the unwanted accumulation of professional, social, physical and spiritual baggage and start anew, this time with the benefit of hindsight and experience. The life-long laundry-list of possibilities is critically reviewed, and attention is focused on a few activities that will bear the most fruit for self-actualization; others are scrubbed off the list forever. Professional time is invested in the antique store or consultancy; fitness is regained at the club and the pharmacy; there is time for one's partner and the theatre and one's grandchildren at the fair. And those great books! Ah! At last time to actually come to grips with this or that important author. However, this process of rediscovery and redefinition of self often requires more energy and resources than were anticipated. The hidden momentum of a lifetime of habits is hard to change. The world in which these dreams and prejudices were formed is not the one that is outside now. And often there is competition against one's own children for a place in the sun. A few people succeed at this second chance to get it right; for many, however, the large investment in re-birth bears a poor dividend.

Stage 8 – Decline: Literature is rich with metaphor, trying to come to terms with the finiteness of life. Whether the candle burns slow or fast, it is brief. We slide with grace or folly into our dotage, our accumulated wisdom decaying and usually ignored, with our great-grandchildren around our knees and relatives eyeing our assets. Our senses slowly lose their acuity, sight becomes dim and sounds become muffled. Other organs begin to malfunction. Digestion is difficult and our heartbeat is irregular. We care less and less for the world that we can no longer control and rely mainly on habit to perform the little that we do. We look inwards to marshal increasingly scattered thoughts on the meaning of life. We stop accumulating and start distributing possessions. Friends have departed, or are equally senile, so we turn to institutional help to survive in the granny-apartment, the retirement village and then the nursing home. Increasingly, more energy is taken in to survive, and less is given out. And finally – dusty death. Our possessions are distributed. Our children live on, carrying our seed and perhaps our ideas and values with them. Others who have been influenced by us in turn have influenced others, but like ripples on a pond, this influence subsides with space and time. And then we are heard no more.

Systems and the Stages of the Life-cycle of an Idea

Such is life and its cycles. Life is indeed much richer and much more subtle than the eight brief paragraphs above. But it is the *essence* of the structure of life that we have tried to portray – the essence of the self as an *embodied idea*, or set of ideas, evolving over time. These ideas are our *physical, intellectual, emotional and spiritual* selves, which grow in complexity and interact with each other as our lives unfold. Each of these ideas of our self can be taken in turn and analysed in terms of its overall form, its constituent parts, and its interactions with the world and other people's lives over time. This is, of course, the work of biographers and novelists, who, implicitly, are searching for the enduring themes in life, and, perhaps, for the exceptions to them. In a literary way, they seek patterns in our existence, to inform us, to reassure us, to alarm us, or maybe just to amuse us. Taken many

millions of times over, these emerging patterns become clearer. Literature continues, but is now paralleled by the life sciences, which seek to *systematise* the wisdom of many observations. By *systematise*, I mean here, as before, *the reduction of a complex whole into sets of related elements*, from which we try to infer some *purpose*.

To our amazement, as we look at the world around us we seem to see the same patterns repeated time and again. There is nothing new under the sun. It is not as though we are seeing exactly the same event time and time again, like *Groundhog Day*, it just seems as though the *basic form* of what we are observing seems to be repeated. Furthermore, we feel that we have a great empathy with that basic form.

Certainly, the changes in the physical form and function of desktop computers from model-to-model hardly look identical to the changes in the physical form and function of a company that makes the computers, or the companies that uses them. Neither does the technical evolution of the automobile engine compare physically with the history of the bureaucracy that regulates automobile emissions, and so on. But we get a feeling of *deja vu* when we view these disparate descriptions. They are different, but they seem to have an underlying similarity – and when we describe them, we somehow seem to be talking about ourselves and how we have changed over time – just like the above description of the *life-cycle*. Also, although we use the words loosely, we increasingly talk about computers and autos and companies and countries as *systems*. That is, *collections of distinct elements that have relationships between them and are unified for some purpose*.

So, in a plausible way, we have arrived at a view that these different things are systems that change over time in a fashion similar to the cycles of life. But at this stage, we are only at the dawn of recognition, and when these different systems are scrutinised under the light of systems analysis, we can start to see how fundamental these similarities really are. But before we can look at these different systems in detail, we need to re-cast our description of the life-cycle in the language of systems. Unfortunately, this will entail reducing the rich texture of life to the bare essentials of *general systems theory*. The *self* becomes a system with purpose, comprising subsystems or elements, and residing in an environment. There are interactions or relationships between the whole self and the environment or super-system, and also between parts of the self and the environment.

The purpose of this exercise, like that of all modelling, is to first simplify the system under observations, and after manipulating this abstract simplicity, to transfer back to the complex reality to see whether we can make some new and useful statements that we could not make before.

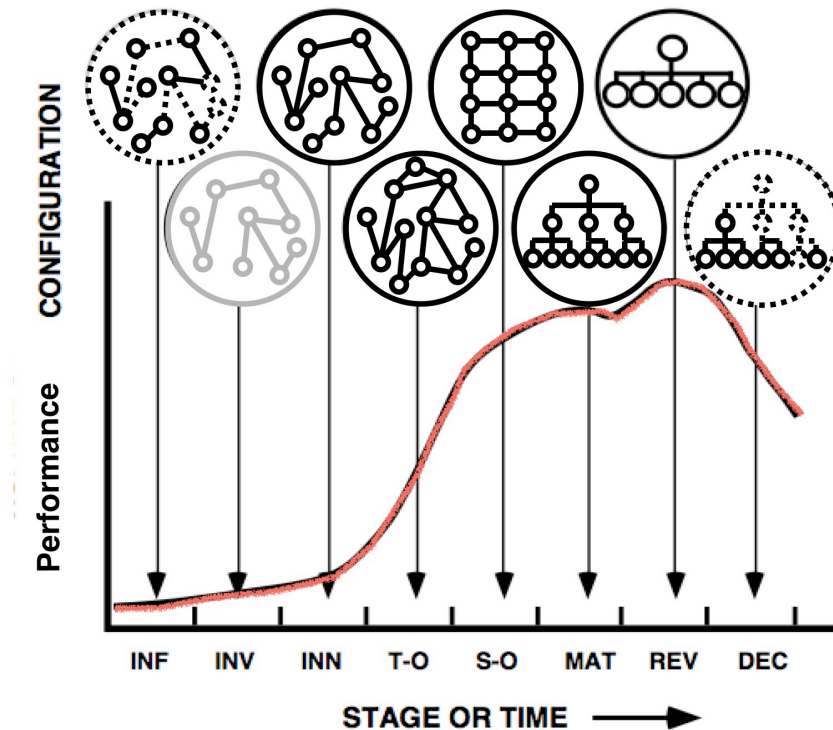
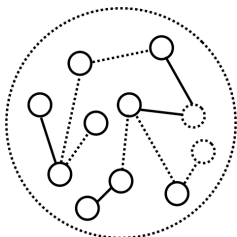


Fig 6.2: The generic Life=cycle, showing the system configurations that depict each stage.



i) Information (INF): Before a system exists in any discernible form, we can see – at least in retrospect – that many of the elements that will comprise the system, and the relationships between those elements, have existed for some time, albeit in a dispersed form. These elements will become ‘sub-systems’ in the system that will become a product, a company or other form of organization. The ‘pre-system’ is depicted by a dotted (virtual) system boundary that is only known in retrospect and some existing (solid) and some virtual (dotted) elements and relationships which we know as ‘facts’ or hypotheses.

These are the elements out of which Schumpeter’s ‘novel combinations’ are formed. In different systems the elements will be different things – people, machines objects and artefacts. The relationships will be the performance characteristics of those subsystems – that is the ways in which those elements respond to communication and interact and in particular, the energy required to obtain those responses. This information will also

include data on the inadequacies of existing systems with respect to achieving the purposes of other systems.

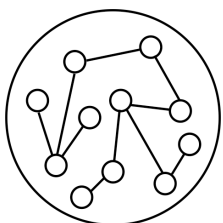


ii) Invention (INV): At this stage, someone, somewhere, will perceive that an existing system will be enhanced (in fulfilling its purpose), by establishing a relationship with a novel configuration (or combination) of elements. This 'novel configuration', or idea, is the initiation, or invention of a new system with a new purpose. The system is now depicted as having a solid (grey) – ie, well-defined – boundary and many well-defined elements and relationships, although the details may be incomplete. The grey lines denote that the system is defined, but still an idea, not a reality.

At the beginning of the *Invention* stage, the system is no more than a conjecture, or something vague and intuitive; at the end of the stage it is a *specification of the essential purpose and relationship between identified elements*. In the case of products, these specifications may range from the formal, such as patents or other intellectual property rights descriptions, through to in-house documentation. In the case of companies and social organizations, it may be the articles and memoranda of association. In the case of inventing a new country, the formal document would be the *constitution*.

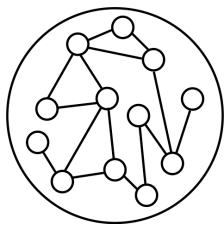
In many cases the specification is not visibly recorded: The details of many technical inventions remain in the mind of the inventor as he or she proceeds to build the product. Some organizations seem to just drift together, with the form and function remaining unspoken between the partners. Nonetheless, there is a point at which the actors would agree that an *idea* is in motion, and if pressed, could articulate it in systems terms of purpose and relationships between certain key elements.

Not all of the elements necessary for the new system to work will have been identified; some will be found to be redundant and at this stage there is no guarantee that the inventor has correctly identified either the nature of the environment, the nature of the invention, or the actual relationships that may eventually occur between the two, or that the invention will ever be viable in any practical sense of the word. In fact, many inventions never get past the specification stage. And as we shall see later, some people never get past the stage of inventing ideas, and form institutions around their inventive habits.



iii) Innovation (INN): During this stage the idea of the system will be given a physical form. This is the prototyping or experimental stage, prior to applying the idea to the wider system or market for which it was conceived. Early prototypes are usually composed of pre-existing elements or components, joined (*ie* related) in previously known ways, using pre-existing equipment, which will contain some redundant elements and relationships between elements. Later models will be characterised as having more novel components, combined with new relationships with novel equipment.

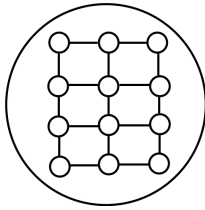
As the idea progresses through this stage we see a more complete and efficient expression of purpose, to the point where the developer has some confidence that the product can successfully express its purpose in the wider environment-*ie* the market. In this stage the inventor/innovator is still an integral part of the system.



iv) Adoption or Diffusion (T-O): In this stage the new system is placed in the market – it ‘takes off’ (T-O) into the wider environment beyond the inventor or innovator. The main distinction between this stage and the previous one is that the wider system outside the production environment uses its *own* energy to establish relationships with the new product, *ie*, they are asked to buy it or adopt it and use it. The system is characterised by a complete set of elements and relationships to make it work, albeit somewhat disorganised (relative to later models) and including many redundant elements and relationships.

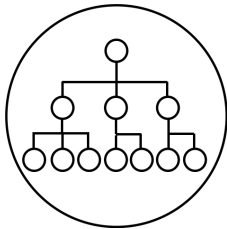
If successful, the idea will continue to evolve, with modifications by the developer, the user, or third parties who imitate the original idea. Modifications to the system essentially aim to give it greater ‘fitness for purpose’, and at this stage are usually elaborations to the internal elements and relationships of the system. Sometimes the changes are to better meet the initial purpose, but frequently, the changes are to meet newly-found purposes which may not have been envisaged by the inventor. This may be encompassed by a broader definition, or even re-definition of the system’s purpose, or the product may branch or evolve into a number of products to meet these other purposes.

This phenomenon of ‘product innovation’ is usually accompanied by changes to the production environment, with the development or adoption of new equipment for more efficient production (*ie* ‘process innovation’). Thus the flow of external energy and information towards the new system is partitioned between internal reconfiguration and development of external relationships. In turn, the establishing of relationships between the new system and existing systems transforms those existing systems, ostensibly towards a more complete expression of their respective purposes. The configuration of elements can be characterised as a mesh. or network, as can the relationships between the system and the wider environment.



v) Shake-out (S-O): Internal elaboration or growth of systems appears to be subject to limiting processes. Given that the system is essentially a processor of information and energy, available energy must be partitioned between internal organization and external expression of purpose. With limits to its own intrinsic efficiency, and the reality of other systems competing for the environment's available energy, the new system's size and purpose start becoming constrained.

Internally, the elements or subsystems are clearly becoming more specific to a particular function and the number and type of relationships are more narrowly defined in terms of the system's overall purpose. At this 'shake-out' stage, many optional purposes are rejected, and the likely total impact of the system on the environment begins to emerge. The configuration is, conceptually, of a *matrix* form.

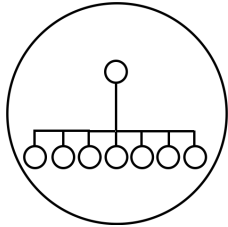


vi) Maturity (MAT): In this stage the relationships between the system and the wider environment become well established and relatively stable, as do the internal relationships. Early in this stage the internal relationships may have a simple hierarchical configuration between specific 'designed for purpose' elements.

In a stable environment this configuration maximises the *system efficiency*, ie minimises the use of available energy allocated to internal transactions or relationships, leaving a maximum for expression of purpose in the wider environment. However, with time, attempts to accommodate to a changing environment see the addition of more elements and relationships to meet these changes, usually with an attendant reduction of system efficiency. The hierarchical configuration means that although the system may be designed for efficient 'vertical' information flows, 'horizontal' information flows are inefficient, and sometimes impossible.

Attempts to rectify these reductions in efficiency by adding more elements in this configuration, or strengthening the internal relationships often cause even further reductions in efficiency. At the same time, suppliers of sub-systems, and other systems producers, may obtain information regarding the problems that the system is encountering

in fulfilling its purpose, and may deliberately try to exacerbate the problems, or commence devising alternative systems to replace the aging system. Amongst all of this activity, the original purpose of the system may become obscured to both users and producers of the system.

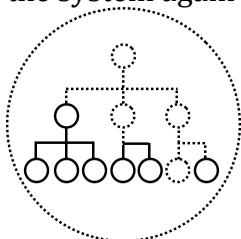


vii) Revitalisation (REV): Although many systems proceed straight from maturity to decline, some may undergo a process of revitalisation. Sometimes this process attempts to reconstruct the system as it was in an earlier stage, particularly *early maturity* or *shakeout*. More often, however, revitalization will take the form of a *re-definition*, or at least strong reaffirmation of the system's purpose, together with a stripping out of many of the 'middle levels' of the previous hierarchical structure, and more direct control of the elements that express the system's purpose to the wider environment by a small number of 'super' elements.

These remaining elements and relationships are usually selected on a strict 'fitness for purpose basis', being designed to uniquely serve the purpose of the particular system.

These drastic changes are also often accompanied by a change in the internal means of communication, which enables the new structure to operate efficiently. These changes are predicated on an accurate assessment of the way in which the system operates internally and how it relates to the wider environment. The re-definition of purpose and internal changes in elements and relationships usually means an increase in *focus* – or, in other words, a reduction in scope – of the system's interaction with the wider environment.

Although this may give the system an immediate increase in efficiency in achieving its stated purpose, it often means that it is less able to respond to changes in the wider environment. Sooner or later, either by poor design, miscalculation, or environmental shift, the system again starts to show signs of failure, and slips into decline.



viii) Decline (DEC): As stated above, sooner or later most systems start to lose their capacity to efficiently express their purpose, particularly relative to other systems in the wider environment with similar purposes. The decline stage is characterised by a breakdown in relationships between elements, a loss of clarity and control of purpose and finally a disintegration of the collection of elements as a recognizable system (dotted lines).

Sometimes elements from a declining system will be utilized in other systems at earlier stages of the lifecycle in another 'novel combination'.

Outcomes of the Life-cycle Model

An important aspect of these thumb-nail sketches is that all eight stages of a system are distinctly different from each other. Not only are the relationships – which define the appearance of each configuration – different, but many of the elements are different as well. The system is considered to be the 'same' system because its *purpose* remains substantially the same throughout the life-cycle. This means that each system-stage behaves somewhat differently, although they are broadly directed towards the same purpose. The analogy with organic living systems, particularly humans, is extensive.

These system-stages form a distinct – and usually *strict* – sequence from the genesis of an idea, through its growth, maturity and to its decline. Any purposeful development, be it an organisation or an artefact, must, therefore, pass through these stages, and therefore, the relationships determined by their respective configurations. To manage the development of an idea, be it a product or a process, one must first understand how to enable it to pass successfully through these stages.

Three key challenges therefore arise about the management of systems across the life-cycle:

- 1) How to effectively and efficiently manage the transition from the preceding stage;
- 2) How to optimise the effectiveness of the system in each stage; and
- 3) How to effectively and efficiently manage the transition to the succeeding stage

Responding to these challenges is as difficult when managing an organisation or a product development as it is in managing (we call it parenting) one's off-spring. While the subsequent chapters of this book will deal with these challenges in depth, for the moment, we provide a little overall 'wisdom': We must recognise and respond to the facts that:

- 1) We are dealing with a system, with purpose, elements and relationships;
- 2) The system relates to other systems and is immersed in other larger systems;
- 3) In order to fully express its purpose, the system needs to undergo changes;
- 4) These changes will usually be in the life-cycle sequence as described;
- 5) The 'configuration' of the relationships between elements is a dominant feature;
- 6) Transitions from stage-to-stage are usually disruptive and often perilous;
- 7) Attempts to revert to an earlier-stage configuration rarely work;
- 8) All life-cycles eventually come to an end.

With this sequence in mind, the objective is to develop the system up to the mature stage, and to make that stage last as long as possible at a high level of activity. But first it must pass through the early stages of development, and withstand the tests of construction and creative destruction as it progresses.

¹ https://en.wikipedia.org/wiki/Complex_system