BUSINESS DESIGN IN THE

ENTERPRISE LIFE-CYCLE

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Abstract

The purpose of this paper is to facilitate systematic management of the design of Enterprises throughout their life-cycle by identifying the events (requirements) which should initiate (re)design. It identifies the high level capabilities required to execute the design and also provides suggestions about the allocation of design responsibilities to organisational elements.

1. Introduction

With the ever-accelerating rate of change in the business environment business leaders are becoming increasingly aware of the need to stay ahead of their competition. This realisation leads to initiatives to improve the efficiency of their enterprises often in an empirical and haphazard fashion. Enterprises are in fact complex systems and as such should be designed in a structured manner. Due to internal factors and changes in the environment business, designs age and need constant refurbishment.

Competitive pressures on companies are continuously increasing with the growing trend towards globalisation. This necessitates companies to become competitive on a global scale i.e. world class companies. Wireman [1] states that :

> *"World class ... ... requires the elimination of complexity.*
> *It requires simplicity in design and ...... processes."*

Elegantly simple designs very seldom result from an approach that adopts the first feasible design that presents itself. It generally requires the generation of a set of alternatives and sound evaluation and decision-making practices to arrive at a good solution i.e. systematic structured design is required.

This paper places the need for business design in a life-cycle context and suggests how the design of an enterprise may be approached.

2. Enterprise objectives

Enterprises are created to contribute to the objectives of their owners over the long term (generate wealth) through satisfying needs for products or services. An Enterprise can satisfy the need for products/services by adding form, place, time, ownership or perceived value to the elements of the product/service or the complete product/service.

3. The life cycle of an enterprise

Enterprises have the nature of self-sustaining systems, which implies that they can adjust to the environment and repair themselves. As shown in figure 1 the life cycle of an enterprise contains a number of loops similar to a closed loop control system [2].

In figure 1 only a single instance of a product life cycle is illustrated by processes 3.2 through 3.10, where one product is initiated by process 3.6 and terminated by process 3.10, whereas in real life many such instances will occur.

The important events in the enterprise life cycle are:

➢ The initial establishment of the enterprise when the entrepreneur identifies an opportunity gathers an entrepreneurial team and develops a new enterprise capability shown as process 2 in figure 1.

➢ This capability when operational needs to be maintained to ensure that it continues to operate as intended despite external impacts. These impacts may be resource impacts e.g. personnel resignations and throughput impacts such as changes in production volumes or

1. Identify the opportunity need for an enterprise
2. Establish an enterprise capability
3. Operate and manage the enterprise capability
   3.1 Maintain the capability
   3.2 Develop products/service
   3.3 Integrate product/opportunity with existing portfolio
   3.4 Develop delivery process
   3.5 Develop support capabilities
   3.6 Integrate into existing capability
   3.7 Identify new opportunities
   3.8 Manufacture/deliver product/service and support items
   3.9 Support the products/service
   3.10 Market and sell products/service
   3.11 Phase out products/service
   3.12 Continuous improvement
4. Re-invest/engineer the capability
5. Phase out enterprise capability

Figure 1:   Business design in the enterprise life-cycle

quality of throughput resources shown as process 3.1 in figure 1. This includes both the product development, process development and 'delivery' functions.

➢ The development of new products and services in response to market feedback implies that changes have to be made to the delivery processes for products and their support.

➢ The operational processes are also subject to internal deterioration with respect to both quality and productivity that must be attended to, to remain competitive.

➢ Changes in the scope of products and services over time can accumulate to a point where the enterprise capabilities can no longer effectively deliver the changed mix.

➢ Alternatively changes in business and information technology (IT) as well as process improvements at competitors may degrade the enterprise's competitive position to the extent that re-engineering becomes imperative.

➢ Whereas it is seldom possible to design all aspects of an enterprise optimally in an analytical way, ample opportunity normally exists to improve the existing enterprise design in an incremental way. This is achieved through continuous improvement programs.

Business Design thus has to cater for all these situations to be effective in providing and sustaining a capability to meet the enterprise objectives.

Sections 4 to 10 of this paper describe the above events and their implications in terms of requirements for Business Design in greater detail.

4. Creating the enterprise

In creating the enterprise, an entrepreneurial team has identified a business opportunity, which has to be developed from scratch. In its most extreme case this may include everything from market research, through product and process development, implementation, start up, operations, sales and support.

The creation of a new enterprise poses a special challenge to the entrepreneur in that he has to first establish a design capability before the enterprise can be designed. In reality this need is seldom recognised. This leads to a situation where most enterprises grow from humble beginnings and incrementally develop their own design either :

➢ In a bottom up manner by combining various elements in an empirical manner and learning from experience what does not work, or

➢ by copying their design (through benchmarking) from enterprises perceived as good role models.

For those fortunate enough to have the insight to realise the need for enterprise engineering and the opportunity to embark on a green fields design it is crucial to thoroughly understand the requirements for their envisaged enterprise [3]. This requires proper market research to ensure sound positioning in viable market segments and an insight into the realisation environment to mobilise the appropriate resources to design a capability which is optimally

matched to the needs and trends in the target markets. The entrepreneur with no previous experience of enterprise engineering would be well advised to employ proven experience to advise and guide the endeavour. In this situation the Enterprise Designer has to fully design the products and services and their support as well as the whole delivery system for the product and support and all the resources by which it is implemented.

The design is therefore less constrained in that there is no current enterprise system into which it has to integrate and that there is no current design capability, which has to be applied to realise the enterprise.

Additionally the Business Designers have the opportunity to determine an optimal cultural design and select people that match its profile. The risk in such a development can be extremely high due to the complexity and scope of the problem and the lack of experience of most entrepreneurial teams.

5. Re-engineering the enterprise

Under re-engineering we handle the case where the internal design of the enterprise as a whole is, or has become inadequate to deliver and support the product portfolio to market i.e. the enterprise has become non-viable. This situation could arise, inter alia, because :

➢ The initial design was inadequate (probably as result of an empirical approach),

➢ the resource technology has become obsolete,

➢ availability has become a problem, or

➢ resource cost have become unacceptable.

These re-engineering exercises seek a breakthrough change from the existing design, which entails major upsets for the current organisation.

According to Hammer [4] (who is widely acclaimed as the father of re-engineering) there are ten commandments for a re-engineering program :

➢ Make sure that you know what re-engineering really is before you attempt to do it – and then do it, not something else.

➢ Only processes can be re-engineered. Before you can re-engineer your processes, you must identify them.

➢ Understanding your processes is an essential first step in re-engineering, but excessive analysis of those processes is a destructive waste of time. You must place strict limits, both on the time you take to develop this understanding and on the length of the description you create.

➢ If you proceed to re-engineering without the proper leadership, you are making a fatal mistake. If your leadership is nominal rather than serious, and is not prepared to make the required commitment, your efforts are doomed to failure.

- Re-engineering requires radical, breakthrough ideas about process design. Re-engineering leaders must encourage people to pursue stretch goals and to think out of the box; to this end, leadership must reward creative thinking and be willing to consider any new idea.

- Before implementing a process in the real world, create a laboratory version in order to test whether your idea works. You will inevitably discover shortcomings and mistakes in your design, which you can then repair. Proceeding directly from idea to real-world implementation is a recipe for disaster.

- You must re-engineer quickly. If you can not show some tangible results within a year, you will lose the support and momentum necessary to make the effort successful. To this end, "scope creep" must be avoided at all costs. Stay focused and narrow the scope if necessary in order to get results fast.

- You cannot re-engineer a process in isolation. Everything must be on the table. Any attempt to set limits to preserve a piece of the old system will doom your efforts to failure.

- Re-engineering needs its own style of implementation: fast, improvisational, and iterative.

- Any successful re-engineering effort must take into account the personal needs of the individuals it will affect. The new process must offer some benefit to the people who are, after all, being asked to embrace enormous change, and the transition form the old process to the new ones must be made with great sensitivity to their feelings.

In re-engineering it is crucial to establish the current reality, find innovative methods to change paradigms, processes and implementation to really establish the most effective and flexible value stream for performing the business. In this situation the whole enterprise has to be re-engineered to become re-aligned with the current demands and trends in its markets.

This design is normally severely constrained in that the existing enterprise and its current interfaces with the existing operating environment imply a host system into which the re-invented enterprise has to fit. The enterprise may have an existing realisation environment for Business Design with certain constraints, and the current resources may have to be re-used in the new design.

The emphasis in this situation is to understand and predict the requirements of the current and future markets – to understand and evaluate the constraints and capabilities offered by the current design, obtain the buy-in of the existing organisation, and implement the structural and cultural transformation. The design of the business transformation also poses a major challenge.

6. Changes in strategic intent

Strategic intent initially guides Business Design in the creation of the enterprise. This intent should ideally evolve over time to track trends in the market, competition, technology and the business and operating environment - sometimes through neglect or lack of insight this does not happen.

If an enterprise suddenly awakens to the need to re-asses its positioning in its field of endeavour drastic changes may be required to the strategic intent. Such changes have a

crucial impact on the Business Design in that the whole product portfolio and all the capabilities may have to be revised to fit the new intent. This creates the most complex challenge for the Business Design where companies with this type of problem have normally not paid much attention to Business Design and do not have a capability for Business Design. These companies nevertheless suddenly have to re-engineer their product portfolio, total business capability and probably the enterprise culture as well, whilst being severely constrained by the existing product range. Support of the existing products has to be maintained even though the products may be discontinued and replaced by new products. The process design is severely constrained by the existing host environment into which it may have to fit and the resources that are currently employed and have to be transformed to the new design.

This challenge requires the Business Designer to:

➢ Establish a design capability,

➢ assess the current reality,

➢ interpret a revised strategic intent,

➢ develop a new integrated portfolio of products and services,

➢ plan integration and migration of the new and old products and services,

➢ develop a revised capability to deliver the new products, and

➢ migrate the existing products and or maintain support for the old products while optimally re-using the resources in the implementation of the new design.

7. Continuous improvement of current enterprise

Continuous improvement applies during the whole life of the enterprise and has the objective of identifying many incremental changes mostly aimed at efficiency improvements. Cumulatively these improvements may lead to substantial impacts on the cost effectiveness of the enterprise. Continuous improvement initiatives are often limited in scope and may impact only on a single or a few activities or resources in the enterprise. The operational personnel may be able to implement these changes on their own by changing the layout sequencing or procedures by which work is performed or requesting/making localised changes to the information technology applications. The challenge to Business Design in this situation is to manage the higher-level system impacts and manage the design baseline. Business Design has to ensure that the limited Business Design resources are optimally utilised. The higher level system impact of improvements have to be managed to ensure that each proposed change is assessed to determine whether it will impact on the higher level system or interfaces with the other elements of the system. In such cases Business Design needs to become involved in the design process by managing the interfaces and integrating design efforts in the proposed and other affected areas.

In all cases the Business Design function needs to be involved with baseline management so as to execute their responsibility as custodians of the enterprise design. This implies that Business Design must have a mechanism to detect, identify and prioritise the business

opportunities and initiatives and provide capacity for management and integration of approved developments – or at least monitors for detrimental impacts of local improvements. Configuration management, design definition and integration and integration testing capability and capacity should at least be provided for.

In some organisation benchmarking of both product designs and process designs is an integral part of each managers critical performance parameters to ensure that they remain aware of best practices in the environment and their own relative performance [5]???. It is obviously expected that continuous improvement programs must be instituted in areas where opportunities are identified which are important for the success of the enterprise and where performance is weak.

8. Product and Service evolution

As shown in figure 1, process 3.7 identifies new product service opportunities from the delivery (3.8), support (3.9) and marketing (3.10) processes. Each new product or service first of all has to be designed itself and then adds to the requirements for delivery and support processes. These processes have to be designed, on the one hand to suit the requirements set by the products and the support for the products and on the other hand to fit into the existing host environment in the enterprise. The requirements for the product have to be known comprehensively i.e. cover all aspects of how the product has to fit into its bigger environment both in terms of how, where and by whom it will be sold, made, distributed, serviced and phased-out as well as aspects arising from its own life-cycle. This means that the products and services need to be integrated into the product portfolio to ensure that the overall position of the enterprise is optimised in its markets for profitability. It further means that the whole life cycle of the product or service needs to be considered, i.e. the forecast demand by channel by market over its life cycle including views of how the product and its support will be phased out, integrated into, or replaced by new/follow-on products. This is especially important where products have a long operational life like a durable system or services such as long-term insurance.

The above emphasises the importance of also providing for the design of product enhancements or a migration path from one product to another. The Business Designer faces the challenge of designing products that complement the product portfolio, devising processes that are maximally compatible with the existing processes as well as complement the demand pattern on resources and which integrate well with the existing enterprise.

These requirements imply that the Business Designer must maintain a solid knowledge base of the existing processes and implementations as well as of the total enterprise capability – preferably captured in formal models. Similarly the product design capability has to have insight into the whole product portfolio and its match and growth to satisfy market demands and trends.

9. Maintaining the capability

Maintaining the capability entails all the actions necessary to ensure that the capability remains viable and suffers no deterioration in performance due to anticipated variations in terms of both the throughput variables as well as the elements or resources by which the design is implemented. Typical examples would be :

- ➢ Variations in demand for services in total or by channel, variant or area,

- ➢ variations in quality of inputs e.g. source data, and

- ➢ changes in the quality or availability of resources e.g. resignations of personnel or degradation in skill.

The responsibility is mainly one of ensuring that the continued compliance of the implemented capability versus the design baseline is monitored and that mechanisms are in place to rectify deviations. This responsibility should primarily be taken by the operational functions of the organisation.

The Business Design function must however ensure that the support infrastructure is designed and that the capability for support is implemented to enable operations to execute this responsibility.

It is also important to monitor the performance of the design in operation to ensure that any deterioration is detected and the effect of local corrective action is visible. If local action in terms of operational initiatives is not successful, Business Design should intervene in terms of providing second or third line support to immediately remedy the situation followed by eventual updates of the enterprise design if required.

10. Maintaining operational efficiency

When business capabilities are implemented and in operation they will only deliver the intended contribution to profit if they are operated at design ratings and the planned efficiency.

Operational efficiencies essentially depend on the scheduling of work, the productivity with which work is performed and the yield of processes i.e. how much of the output produced is of acceptable quality. These parameters need to be managed by the operational managers.

To enable the management to monitor the processes, detect deviations timely and allow them to respond appropriately, proper management information system tools are required. These tools need to be designed into the business capabilities so that management information is automatically generated as part of the operational processes.

Process controls rather than go-no-go checks are recommended to ensure that negative trends are detected before they actually exceed control limits. This will enable pro-active initiatives to prevent failures rather than to correct them. The pro-active actions may involve adjustments to the enterprise design that could involve the Business Designers.

Results from the management information system should be fed through to the Business Designer responsible for the capability design as part of an ongoing design performance feedback system. This feedback should be incorporated into the knowledge base to verify and update process and implementation standards and benchmarks.

The preceding sections have expanded the requirements of what Business Design has to attain. These requirements may be translated into how the design should be executed by investigating a methodology and process for design.

11. Methodology required for enterprise design

What has to be designed and the proposed methodology determine the capabilities required for enterprise design. The preceding sections have identified the various sources of needs and the types of need.

A system engineering methodology is proposed as illustrated in figure 2 with an appropriate knowledge base and tool-set to support it.

The systems engineering methodology entails a generic iterative converging process as illustrated in figure 3. Figure 3 depicts a case where the external stimulus for development is a requirement for developing a product or service. It illustrates four cycles of development to finalise the product design and two cycles of development to implement the delivery and two cycles of development to implement the delivery capability. The multiple development cycles are based on the translations in design and are mainly aimed at managing risk at each level of abstraction.
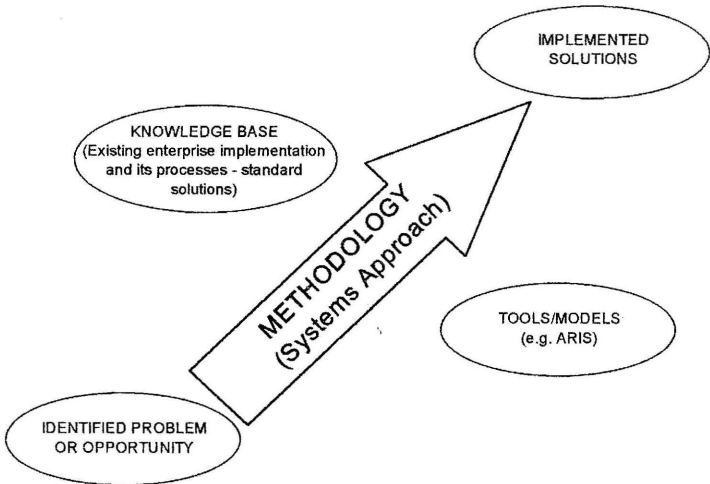

Figure 2:   System engineering methodology for development

12. Capabilities required to interpret needs in product design

The capabilities required of the Enterprise design function are determined by the requirements implied by the phases and translation into product and delivery system development as shown in figure 3.

The four product development iterations i.e. conceptual development, preliminary development, experimental development and full scale development are followed by two production development phases i.e. engineering development and industrialisation.

The translations required during product development are as follows :

➤ The conceptual phase focuses on defining the clients' needs in an accurate and comprehensive way as well as thoroughly understanding his value system and translating this into the functions that the product has to perform in order to satisfy the clients needs. The other steps in the framework are performed perfunctorily to establish:

♦ The validity of the clients' needs.
♦ Technical feasibility of complying with the need.
♦ Ability of the existing/envisaged enterprise to design and deliver the product.
♦ Business feasibility (business potential).
♦ Supportability feasibility (Support concept).
♦ An approach to develop further with the least risk.

Figure 3:   System Development Process
(Adapted from [6] and [7])

➤ In the preliminary development phase the focus is on selecting the correct system concept i.e. the translation of the functional requirements of the system from the conceptual phase to technical design requirements for subsystems - suitably partitioned to match the development organisation whether in-house or outsourced. This phase provides:

♦ Development specifications per subsystem considering the support concept (supportability) and manufacturability/producibility.
♦ Associated development approaches per subsystem.

- ♦ Development approach for support system development.
- ♦ Firm sourceing decisions for both the production and operational phases.
- ♦ Confirmation of technical and operational feasibility.
- ♦ Revised and upgraded preliminary business case.
- ♦ Revised development approach.
- ♦ Plans and budgets for the next phase.

➢ Experimental development is only required for system segments that pose a high risk in detail development. In this case it is normally prudent to fully develop and qualify this segment of the design before it becomes a showstopper. The process followed is similar to that used in full-scale development.

➢ Full-scale development focuses on realising the development specifications and achieving an integrated implementation for the system. It is thus about detail structures, flows, interfaces and optimal component selections. Here the translation is from a type of implementation element to the detail design of the element i.e. its implementation characteristics specified in detail. This phase produces :

- ♦ Detail product designs.
- ♦ Detail support design.
- ♦ Revised plans for production development.
- ♦ Final business case to proceed to production.
- ♦ Prototypes.
- ♦ Test reports that prove the systems compliance.

To summarise, product development provides a design, in the form of a set of design documentation, that when built has been "proven" to perform in such a way that it will satisfy the requirements of the client.

13. Capabilities required to interpret needs in delivery design

During the two phases of delivery process development the following translations are required:

➢ Engineering development which translates product requirements, i.e. features required, into requirements for processes to create the features and deliver the products. It further translates the processes into requirements for the generic implementation elements by which the processes can be executed which establishes the conceptual design for the delivery system (either new or adaptations to the existing system). In this phase the product delivery demands are reviewed and a delivery approach developed which includes:

- ♦ Selecting the type(s) of delivery systems to cope with the expected product market life cycle.
- ♦ Taking of sourcing (make-buy) decisions with respect to the delivery processes.
- ♦ Refining the product design to adapt to produce-ability, manufacturability and supportability requirements overlooked during earlier development.
- ♦ Design of process flows and process type selection down to activity level.
- ♦ Allocation to production/support resources.

♦ Syntheses of conceptual designs, e.g. equipment identification, infrastructure layouts, software architectures, database architecture, delivery manpower structures and knowledge architectures.

♦ Design requirements for the detail design of the delivery elements and their integration.

➢ Industrialisation translates the design requirements into the detail design documentation for the delivery elements, procures the elements according to these specifications and integrates the elements into the initial delivery and support capability. This phase includes trial runs to prove the capability of the system. The output of this phase includes :

♦ Detail designs or specifications for :
  • Delivery equipment.
  • Delivery facilities.
  • Deliver job/man specifications.
  • Delivery work instructions.
  • Software (programs).
  • IT infrastructure.

♦ The operational system :
  • Computer programs, populated databases and IT infrastructures for operations and support.
  • Buildings and facilities.
  • Logistic equipment.
  • Delivery equipment.
  • Trained operational personnel.
  • Trained support personnel.
  • Integration of the above.

♦ Management system for :
  • Sales.
  • Operations.
  • Logistics for throughput elements.
  • Maintenance.
  • Operational and support data feed-back .
  • Configuration management.
  • Distribution.

14. Capabilities to design at a level of abstraction

Each development iteration, as depicted in figure 3, consists of eight steps. This means that the Business Design must provide capability for :

➢ Re/definition of the requirements arising from the external environment or previous phase interpreted to the level of abstraction for the phase envisaged so that it is clear what this iteration of design has to achieve, e.g. customer wants are translated into product functions.

- Re/definition of the value system of the "client" translated and interpreted to the appropriate level of abstraction to guide and focus design effort and provide a basis for trade-off.

- Requirements/problem analysis, which partitions and cascades requirements to a level where adequate allocation of functionality to implementation, can be established for the purposes of the applicable phase.

- System synthesis - which identifies one or multiple alternative "low level" implementations and identifies possible ways in which these may be integrated to a system level.

- Modelling - which selects and develops tools to cascade and partition requirements, and assess the possible alternatives for sifting, synthesis, evaluation and trade-offs.

- Analysis, evaluation, optimisation where the alternative(s) proposed is evaluated in terms of appropriate measures for the phase.

- Decision-making and recording is where an alternative is selected, its value/worth predicted and recommendations as to whether to proceed with development are reached. Where further development is proposed, the specifications to be achieved by the next phase and business case are recorded.

- Planning further development - reviews the development approach, determines plans, budgets and milestones for the next phase of development, which reflect the incremental risk of proceeding with further development.

15. Capabilities summarised

The requirements for a Business Development capability may be summarised from the above by the steps in the development cycle. These elements may then later be allocated to organisational groupings. Tables 1 to 5 summarise the requirements by development phase and development step.

16. Capabilities allocated to roles

In order to implement the requirements for a Business Development capability the allocation of tasks to organisational groupings has to be done taking cognisance of the available skill-sets in the market as well as the demands placed on the management structure who have to guide and control it. A generic structure showing the allocations of functions to organisational units based on benchmarking with a number of prominent players in the authors' industries is shown in figure 4.

17. Conclusions

By placing enterprise design in a life-cycle context the enterprise designers are provided with a framework, which facilitates monitoring for events which should trigger re-design and which can improve focus in determining the design requirements for such a design effort. The proposed allocation of responsibility for establishing and maintaining the enterprise design can help management to structure the business development functions more effectively.
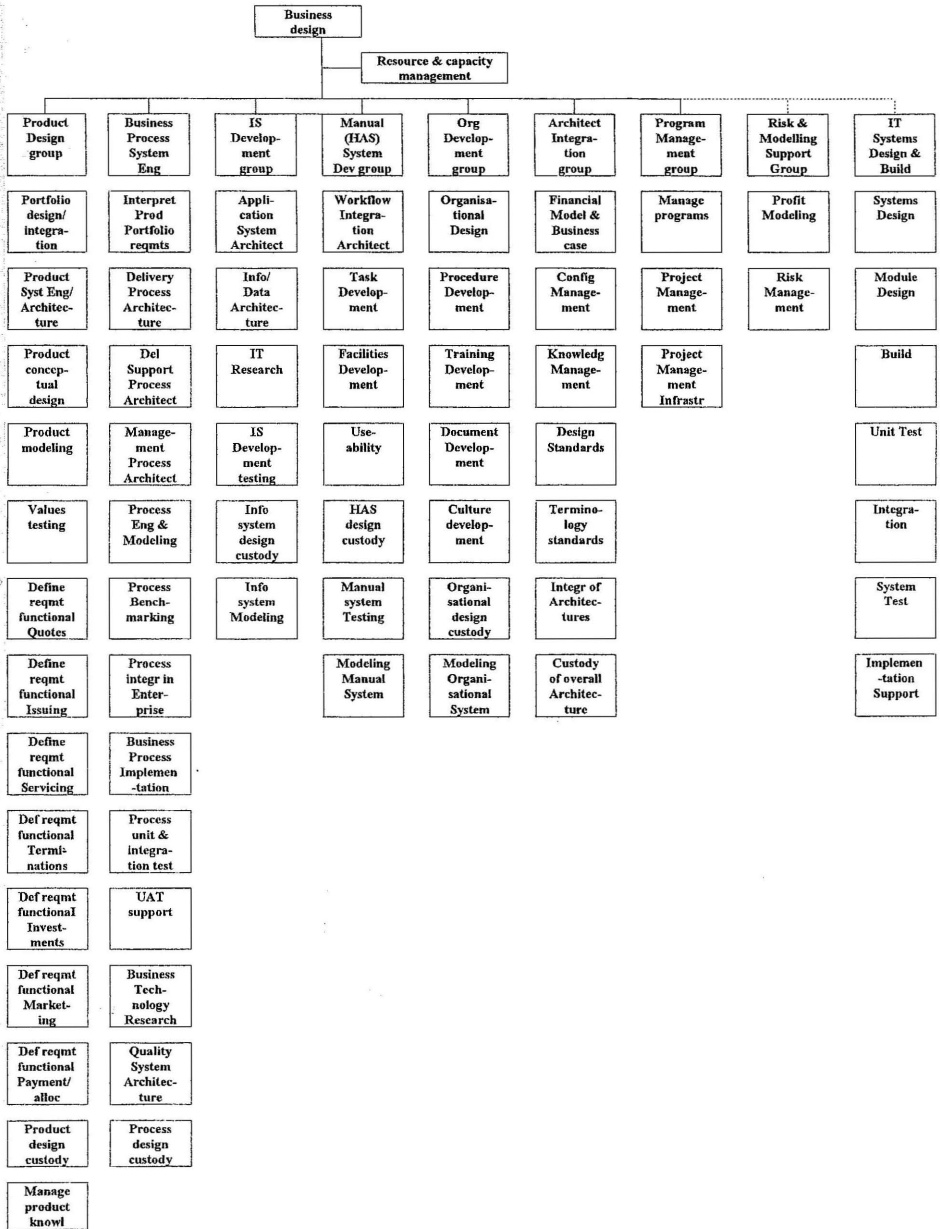
Product Design group	Business Process System Eng	IS Development group	Manual (HAS) System Dev group	Org Development group	Architect Integration group	Program Management group	Risk & Modelling Support Group	IT Systems Design & Build
Portfolio design/integration	Interpret Prod Portfolio reqmts	Application System Architect	Workflow Integration Architect	Organisational Design	Financial Model & Business case	Manage programs	Profit Modeling	Systems Design
Product Syst Eng/Architecture	Delivery Process Architecture	Info/Data Architecture	Task Development	Procedure Development	Config Management	Project Management	Risk Management	Module Design
Product conceptual design	Del Support Process Architect	IT Research	Facilities Development	Training Development	Knowledg Management	Project Management Infrastr		Build
Product modeling	Management Process Architect	IS Development testing	Use-ability	Document Development	Design Standards			Unit Test
Values testing	Process Eng & Modeling	Info system design custody	HAS design custody	Culture development	Terminology standards			Integration
Define reqmt functional Quotes	Process Benchmarking	Info system Modeling	Manual system Testing	Organisational design custody	Integr of Architectures			System Test
Define reqmt functional Issuing	Process integr in Enterprise		Modeling Manual System	Modeling Organisational System	Custody of overall Architecture			Implementation Support
Define reqmt functional Servicing	Business Process Implementation							
Def reqmt functional Terminations	Process unit & integration test							
Def reqmt functional Investments	UAT support							
Def reqmt functional Marketing	Business Technology Research							
Def reqmt functional Payment/alloc	Quality System Architecture							
Product design custody	Process design custody							
Manage product knowl								

Figure 4: Generic structure for Business Design

Business Design is approached in this paper from a systems engineering methodology as opposed to the more conventional IT architectural approaches.

The findings are based on literature research augmented by consultation with acknowledged leaders in the field of systems design and enterprise engineering combined with the authors' own experience of implementing Business Designs in a variety of enterprises.

The management and leaders of enterprises are accountable both for establishing, enhancing and maintaining an organisational capability for the business in which they are engaged as well as the efficient application of this capability.

The development and maintenance of enterprise capabilities require unique and focussed attention that does not synergise well with the day to day operations of an enterprise.

Seven situations can be distinguished which initiate enterprise design :

1) When a new enterprise is established.

2) When the strategic intent of the enterprise changes e.g. a new focus in terms of target markets; products, canals or value proposition is pursued.

3) When through organic growth or advances in business or information technology needs, opportunities arise to improve the business processes by which the enterprise achieves its outcomes.

4) When enhancements or new products or services are added to the existing products or product range.

5) When operational functions engage in continuous improvement programs.

6) When disturbances in the resource or business environment force the operational functions to adjust or maintain its capabilities.

7) When operational efficiencies decline or fall behind competitors.

These situations require different mechanisms to monitor and detect them and a different approach to handle their impact on the enterprise. The responsibility for reacting to the impacts should also be in different places.

Enterprises should provide for Business Design at the different levels in the organisation and though mainly focussed in a separate development function Business Design should also pervade the product design, operational, marketing, strategic design, sales and supporting functions.

By implementing these proposals, businesses can be structured to effectively establish and maintain the design of their capabilities. This would lead to more timely discovery of the needs for redesign, less duplication in design, lower risk of voids in the Business Design and clearer accountability.

STEPS PHASE	Problem definition	Value system design	Problem analysis	Model problem/ alternatives	Synthesise alternatives	Evaluate and optimise	Specify and decide	Plan, initiate next phase
Strategy development	Establish vision/mission	Strategic drivers	SWOT translation to strategic gaps, stakeholder analysis	Scenario planning, decision analysis	Strategic alternatives		Strategic intent	Strategic actions
Portfolio design	Life cycle requirement for product, market, channel, value mix and shifts	Life cycle profit effectiveness	Translation of strategic intent to product Qualifying and winning criteria, Market trend analysis, scopeing	Model overall business, Boston consulting group analysis, Sigmoid analysis		Overall profit potentials, trade-offs	Portfolio plan/priorities	Portfolio development program, initialise product development, establish development team

Table 1 :   High level capabilities required for strategic business design

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STEPS / PHASE	Problem definition	Value system design	Problem analysis	Model problem/ alternatives	Synthesise alternatives	Evaluate and optimise	Specify and decide	Plan, initiate next phase
Product concept development	Establish market requirement for product, support and phase-out	Client value system, profit objectives	Needs/wants analysis, translation to functionality, requirement validation	HOQ feature function weighting and, profitability models	Conceptual technical and delivery solution	Product feasibility, business potential, requirements review	Functional specification for product, support and phase-out	Development approach, plan for preliminary development
Preliminary product and support development	Functional requirements for product, support and phase-out	Design to cost goals per function	Functional analysis with cascaded design requirements, translation functions to design requirements	Functional block diagram performance models, RAMD model, Trade-off studies	Technology scanning, innovation, design influencing	Confirmed technical and operational feasibility, preliminary business case, concept review	Firm product and support concept, sub system development specification	Development approach, plan for full scale development
Full scale product and support item development	Design to requirements for product and sub-systems	Life cycle cost, RAMD, performance, flexibility	Functional analysis, and allocation, support requirement analysis, translate requirements to designs	Model low level alt's and their integration, FMECA, trade-off studies	Scan for alternative ways to implement, create innovative integration's	Trade-off alternatives Prototyping and qualification test, confirm business case, detail design review	Qualified detailed product and support item design, proceed to production	Development approach, plan for concept business development

Table 2 :   High level capabilities required for product design

STEPS PHASE	Problem definition	Value system design	Problem analysis	Model problem/ alternatives	Synthesise alternatives	Evaluate and optimise	Specify and decide	Plan, initiate next phase
Concept development for delivery system	Review product and delivery requirements for products, support and phase-out, Translate product requirement to processes	Demand profile, Roll-out date, Capital cost, Delivery and support costs, Break-even, culture fit	Product operational analysis, Support analysis, Translate values, Preliminary process analysis, Cultural analysis, Influence diagramming	Context diagram, LSA tools, HOQ feature/ process mirroring, process modelling, capacity models, simulation	Scan business technology, define delivery approach, conceptualise implemen-tation into sub-systems, id culture implications	Evaluate concept, confirm delivery feasibility vs. volumes, time to market and cost,	Process specification for delivery system, decide on preliminary development of the delivery system	Development approach, plan for preliminary business development
Preliminary delivery system development	Review process requirements for delivery system, Assess current processes and / or processes implied by packages	Process performance, Life-cycle cost requirement's, Reliability, availability, maintainabilty and dependability requirements	Detail process analysis, cascade requirements, translate process requirement to activities to implimen-tationn concept	EPC models, Data models, Extended entity relationship models, capacity modelling, LCC models	Scan process technology, product optimisation, process flows, implement requirement allocation	Confirmed technical and operational feasibility, reviewed business case, bench mark processes	Specifications for development and integration of implemen-tation sub systems, decide on detail delivery design	Development approach, plan for detail business development

Table 3 : High level capabilities required for delivery system design

STEPS PHASE	Problem definition	Value system design	Problem analysis	Model problem/ alternatives	Synthesise alternatives	Evaluate and optimise	Specify and decide	Plan, initiate next phase
Detail design for delivery system	Requirements for detail design of sub systems	Allocated performance, cost, timeline, dependability, support requirement	Software requirement analysis, activity analysis, MMI and human factors analysis, information data analysis, translate implemen-tation concepts to specifications for elements	Manufactur-ability, supportability, layouts, timelines, performance models, capacity modelling	Scan implemen-tation technology, packages, Database designs, IT system design, equipment designs, job specifications, training specifications, form and screen specifications, facility design specifications for IT, infrastructure, integration specifications, process controls, work flow design	Final technical and operational feasibility, final business case, FMECA on delivery capability, value engineering, prototyping and testing	Procurement and integration specifications for elements:	Development approach, plan for business implemen-tation

Table 3 :   High level capabilities required for delivery system design (continued)

STEPS PHASE	Problem definition	Value system design	Problem analysis	Model problem/ alternatives	Synthesise alternatives	Evaluate and optimise	Specify and decide	Plan, initiate next phase
Procurement/ construction of delivery system elements	Procurement or build to or personnel requirements, confirmation of compliance	Timely cost effective delivery and support of dependable elements to specification	Supplier and developer analysis, review design to purpose sub systems, Translate element specifications to elements	Total cost of ownership modelling, interface modelling for design to purpose sub-systems	Structuring of contracts, supplier interfaces and financial engineering,	Design and acceptance testing, psychometric testing of personnel, test compliance of deliverables	Qualified delivery system elements - programs, databases, IT infrastructure, procedures, forms, ops personnel, support personnel, support items, MIS, equipment, facilities	Integration approach, plan for implemen-tation of business
Integration of delivery system	Assembly/ integration design requirements, assurance of compliance	Dependable capability, operating to design parameters, well supported, timely on budget	Translate elements into integrated system, analyse physical integration design into integration tasks	Interface and integration designs for physical elements of delivery system	Physical integration and adjustment of interfaces of delivery system and its support	Integration testing of delivery system and delivery system support, certification of personnel	Integrated delivery capability, integrated support capability, trained personnel	Integration approach, plan for commissioning of business

Table 4 :   High level capabilities required for delivery system implementation

STEPS PHASE	Problem definition	Value system design	Problem analysis	Model problem/ alternatives	Synthesise alternatives	Evaluate and optimise	Specify and decide	Plan, initiate next phase
Commission delivery system	Requirement to integrate: Clients, master data, personnel, schedules, management, capacity with the business system	Seamless operation, ease of transition, ease of management, transparency	Translate integrated system into working capability, analyse system integration design into integration tasks	Interface and integration designs for physical with people and management elements of delivery system	Management integration and change management for personnel of delivery system and its support	Operational test and acceptance of commissioned system, verification of business case	Migrated data, operational processes, delivery of output, maintained readiness	Plan for initial deliveries of business
Support delivery system	Requirement to ensure capability stays operational and optimally aligned with trends in: markets, technology, competition and resources	High operational readiness, successful support, maintained profitability	Availability analysis, profitability analysis, maintainabilty analysis, Demand forecasts, technology forecasts, competitive analysis	Availability models, Maintainabilty models, FRACAS, Demand models, HOQ competition, profit models	Integrate actual and predicted operation of capability design wise in the greater organisation and over its life.	Monitor operational performance, availability, support, markets, competition, technology, resource trends	Corrective actions on design of the delivery capability, corrective actions on design of the business capability	Plan for initial support of business, plans for redesign of support for capability, plans for redesign of capability

Table 5 :   High level capabilities required for delivery system commissioning

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