

A Structured Systems Approach to Model Conceptualisation: An Executive Management Perspective

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requirements for the degree of

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in the

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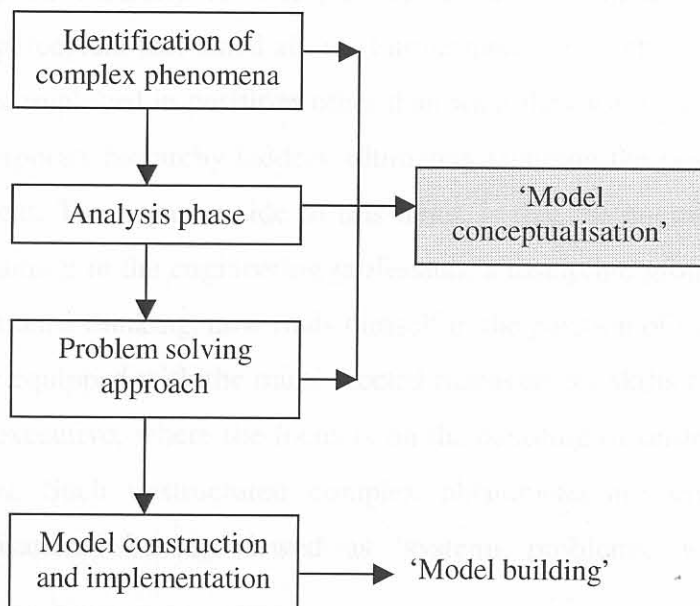
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ABSTRACT

Title: A Structured Systems Approach to Model Conceptualisation: An Executive Management Perspective.
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Degree: Philosophiae Doctor.

This thesis is about a specific *structured systems approach to model conceptualisation*, a way of ‘thinking’, about unstructured complex phenomena within the ambit and context of executive management. This way of ‘thinking’, according to Checkland [29], although broadly part of the science movement, uses some concepts, which are complementary to those of classical natural science. Model conceptualisation within the context of this thesis and graphically depicted below, refers to a specific sequence of events, which precedes ‘model construction’ and ‘model implementation’. These events include:

- The identification of unstructured complex phenomena.
- The analysis of the identified unstructured phenomena.
- The problem solving approach, which is to be followed to solve the identified complex phenomena.



This *structured systems approach to model conceptualisation*, this way of ‘thinking’, implies thinking about the world outside ourselves, and doing so by means of a concept ‘system’, very much in the same way as envisaged by Einstein, in an extract cited by Schilpp [145]:

“What, precisely, is ‘thinking’ ?” “When at the reception of sense impressions, memory pictures emerge, this is not yet ‘thinking’ ”.

“And when such pictures form series, each member of which calls forth another, this is too not yet thinking”. “When, however, a certain picture turns up in many such series, then – precisely through such return – it becomes an ordering element for such series...” “Such an element becomes an instrument, a concept”. “I think that the transition from free association or ‘dreaming’ to thinking is characterised by the more or less dominating role which the ‘concept’ plays in it”.

For a number of valid business reasons, including the perceptual fact that ‘engineers are structured problem solvers’, engineers world-wide are drawn into professions other than engineering. This trend, which was evident from this research and contained in the research findings, is most prevalent in banks, the information technology industry, processing companies, financial institutions and consulting fields where engineers often form the core of the workforce at every level of the organisation hierarchy. A variety of reasons, can be attributed to this trend including the perceptual fact listed above. Furthermore, research shows that invariably, engineers employed in positions other than what they were trained for, rapidly climb the corporate hierarchy ladders, ultimately attaining the position of executive management. The negative side of this trend, is that the engineer who primarily has had training in the engineering profession, a discipline grounded in analytical and reductionist thinking, now finds himself in the position of executive management, hardly equipped with the multi-faceted management skills typically demanded from an executive, where the focus is on the handling of unstructured complex phenomena. Such unstructured complex phenomena are invariably societal and organisational based, viewed as ‘systems problems’ within a



particular worldview or ‘*weltanschauung*’ and require systems-integrated solutions to solve.

While this thesis has at its core the objective to introduce the concept of a *structured systems approach to model conceptualisation* into the realm of executive management within a broader context, it is in the view of the author the most suitable structured mechanism specifically aimed at the engineer in the emergent role of executive management dealing with unstructured complex phenomena.

A further consequence of this thesis, is that the author succeeds to bridge the gap between ‘hard’ and ‘soft’ systems methodologies, by combining the two disciplines to form a ‘midway approach’ in solving unstructured complex phenomena. In addition, the research findings show that such an approach manifests as an essential mechanism for modern executives to facilitate the resolution of unstructured complex phenomena within their respective organisations in a structured way. Furthermore, the research findings show that management philosophies formulated by revered academics during the Twentieth Century can be applied with success to Twenty First Century unstructured complex phenomena, thus becoming an accepted alternative management mechanism for this purpose.

This thesis then, is about both a ‘*structured systems approach to model conceptualisation*’ and ‘systems practice’ and the relationship between the two entities, aimed at dealing with unstructured complex phenomena within the ambit of executive management. From this the conclusion can be drawn that the systems dynamics of the formulated *structured systems approach to model conceptualisation* specifically applied to the art of executive management, can be used to structure the outcomes of paradigm shifts introduced into organisations as a result of unstructured complex phenomena. Furthermore, the outcome of the research is not as much ‘*an approach*’, as it is a ‘*set of principles to an approach*’, which in any particular situation have to be reduced to a method uniquely suitable to the particular situation, hence the applicability of the



structured systems approach to model conceptualisation over a spectrum of disciplines.

The structured systems approach to model conceptualisation is a methodology that is used to develop a model of a system. It is a structured approach to the development of a model, which is based on the principles of systems analysis. The structured systems approach to model conceptualisation is a methodology that is used to develop a model of a system. It is a structured approach to the development of a model, which is based on the principles of systems analysis. The structured systems approach to model conceptualisation is a methodology that is used to develop a model of a system. It is a structured approach to the development of a model, which is based on the principles of systems analysis.



SAMEVATTING

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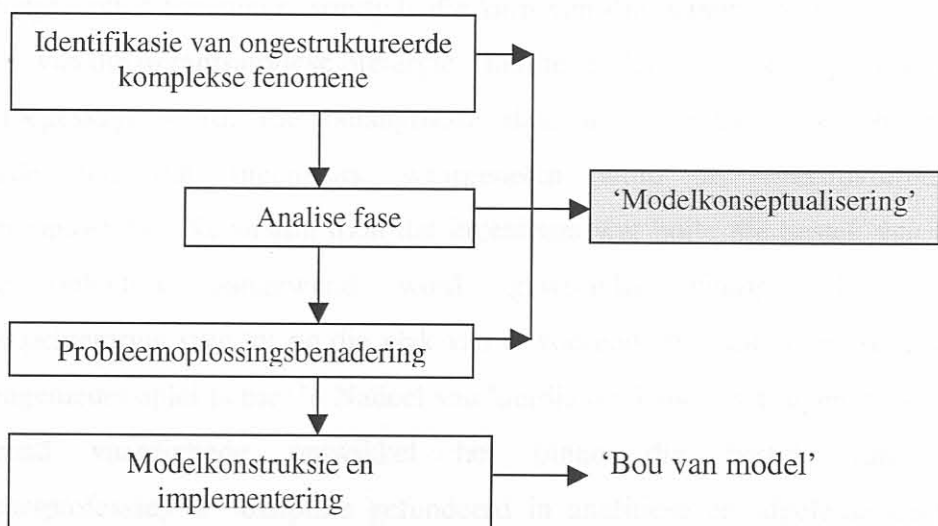
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Graad: Philosophiae Doctor

Hierdie proefskrif adresseer spesifiek 'n gestruktureerde stelselsbenadering met betrekking tot modelkonseptualisering, 'n 'wyse van denke' tot die oplossing van ongestruktureerde komplekse fenomene soos dit voorkom binne die konteks van uitvoerende bestuur. Hierdie 'wyse van denke' volgens Checkland [29], verwys na denke wat oorhoofs deel uitmaak van die wetenskaplike beweging en wat gebruikmaak van konsepte wat komplementêr is tot die klassieke natuurwetenskappe. Modelkonseptualisering binne die konteks van hierdie proefskrif en grafies voorgestel hieronder, verwys na 'n spesifieke volgorde van gebeurtenisse wat 'modelkonstruksie' en 'modelimplementering' voorafgaan. Hierdie volgorde van gebeurtenisse sluit die volgende in:

- Die identifikasie van ongestruktureerde komplekse fenomene.
- Die analise van sodanige ongestruktureerde komplekse fenomene.
- Die probleemoplossingsbenadering wat gevolg sal word vir die oplossing van die geïdentifiseerde ongestruktureerde komplekse fenomene.



Hierdie gestruktureerde stelselsbenadering met betrekking tot model konseptualisering, hierdie ‘wyse van denke’, verwys na denke buite die perseptuele raamwerk van die mens by wyse van die konsep ‘stelsel’, soos waargeneem deur Einstein en aangehaal deur Schilpp [145], (hier aangehaal in die oorspronklike teks):

“What, precisely, is ‘thinking’ ?” “When at the reception of sense impressions, memory pictures emerge, this is not yet ‘thinking’ ”. “And when such pictures form series, each member of which calls forth another, this is too not yet ‘thinking’ ”. “When, however, a certain picture turns up in many such series, then – precisely through such return – it becomes an ordering element for such series...” “Such an element becomes an instrument, a concept”. “I think that the transition from free association or ‘dreaming’ to thinking is characterised by the more or less dominating role which the ‘concept’ plays in it”.

As gevolg van geldige besigheidsredes, die vernaamste daarvan die aanvaarde feit dat ingenieurs wêreld-wyd waargeneem word as ‘gestruktureerde probleemoplossers’, word ingenieurs gereeld in posisies binne organisasies aangestel vir doeleindes wat buite die bestek van hulle formele opleiding as professionele ingenieurs val. Hierdie praktyk, wat ook duidelik blyk uit die navorsingsresultate, is veral waarneembaar by banke, inligtingstechnologie maatskappye, prosesmaatskappye, finansiële instellings en konsultasie maatskappye waar ingenieurs somtyds die kern van die personeelkorps vorm op elke vlak van die organisatoriese hiërargie. Hierdie tendens kan aan ’n legio aantal redes toegeskryf word, die belangrikste daarvan moontlik, die genoemde aanvaarde feit dat ingenieurs waargeneem word as ‘gestruktureerde probleemoplossers’. Navorsing toon dat ingenieurs wat buite die bestek van hul formele opleiding aangewend word, gewoonlik vinniger binne ’n organisasiehiërargie styg tot op die vlak van uitvoerende bestuur, as persone wat nie as ingenieurs oplei is nie. ’n Nadeel van hierdie tendens is dat ingenieurs, wat oorwegend vaardighede ontwikkel het binne die bestek van die ingenieursprofessie, ’n disipline gefundeerd in analitiese en afgeleide denke,

hulself nou in 'n uitvoerende bestuursposisie bevind sonder die spektrum van bestuursvaardighede soos vereis van die pos van die uitvoerende bestuurder met betrekking tot modelkonseptualisering, waar die aksent by uitstek gefokus word op die hantering van komplekse fenomene. Hierdie ongestruktureerde komplekse fenomene het normaalweg 'n gemeenskaps- en organisatoriese basis, word waargeneem as 'stelselprobleme' binne die bestek van 'n spesifieke waarneming van die wêreld of '*weltanschauung*', en vereis stelsels-geïntegreerde oplossings.

Terwyl die doel van hierdie proefskrif die toepassing van 'n gestruktureerde stelselbenadering met betrekking tot modelkonseptualisering binne die breë bestek van uitvoerende bestuur is, is die outeur van mening dat sodanige gestruktureerde benadering 'n hoë toepaslikheidsgraad het op die ingenieur in die rol van uitvoerende bestuur, veral met betrekking tot die oplossing van ongestruktureerde komplekse fenomene.

'n Verdere gevolg van hierdie proefskrif is dat die outeur met sukses die gaping tussen 'harde' en 'sagte' stelselmetodologieë oorbrug, deur die twee uiteenlopende begrippe te kombineer in 'n 'middeweg' benadering vir die oplossing van ongestruktureerde komplekse fenomene. Die navorsingsresultate van hierdie proefskrif toon verder dat sodanige 'middeweg' benadering manifesteer as 'n noodsaaklike meganisme vir uitvoerende bestuur in die gebruik daarvan vir die oplossing van ongestruktureerde komplekse fenomene op 'n gestruktureerde basis binne hul onderskeie organisasies. Verder toon die navorsingsresultate van hierdie proefskrif dat bestuursfilosofieë wat ge-formuleer is gedurende die Twintigste Eeu, met sukses toegepas kan word vir die oplossing van ongestruktureerde komplekse fenomene van die Een-en-Twintigste Eeu, en ook aanvaar word as 'n alternatiewe bestuursmeganisme vir hierdie doel.

Hierdie proefskrif, het dus ten doel die formulering van 'n gestruktureerde stelselbenadering met betrekking tot model konseptualisering, en gepaardgaande 'stelselstoepassing', en die verhouding tussen die twee konsepte, gemik op die oplossing van ongestruktureerde komplekse fenomene binne die bestek van uitvoerende bestuur. Vanuit hierdie samevatting, kan die afleiding gemaak word dat die stelseldinamika van 'n die 'n gestruktureerde stelselbenadering met



betrekking tot model konseptualisering wat spesifiek geformuleer is vir die gebruik deur uitvoerende bestuur, gebruik kan word om die uitkomste van paradigmaterskuiwings te rig wat in organisasies plaasvind as gevolg van ongestruktureerde komplekse fenomene. Die resultaat van hierdie navorsing dui meer op 'n *'stel riglyne tot 'n benadering'*, as op 'n *'spesifieke benadering'* wat in enige situasie gereduseer moet word tot 'n unieke metode, geformuleer vir 'n spesiale toepassingsveld. Hierdie feit maak die gestruktureerde stelselsbenadering met betrekking tot model konseptualisering, hoogs toepaslik vir die doeleindes van model konseptualisering oor 'n spektrum van dissiplines.

ACKNOWLEDGEMENTS

This, my second doctoral thesis, has been undertaken with the true belief that my years of ‘thinking’ and ‘practising’ a unique structured approach to management, can facilitate the task of every managing executive to the extent of solving unstructured complex phenomena. Furthermore, it is my conviction that this ‘set of principles to an approach’, which is based on the philosophies formulated by revered academics during the Twentieth Century and, which includes the author’s own contribution, can add value to the existing body of knowledge and the art of executive management. This with particular reference to the systems dynamics of the formulated *structured systems approach to model conceptualisation* when applied by executive management of the Twenty First Century, to structure the outcomes of paradigm shifts introduced into organisations as a result of unstructured complex phenomena.

In submitting this thesis, I wish to take this opportunity to express my sincerest appreciation and gratitude towards the following persons, for their specific and valued contributions:

- My wife Hanneljie, my friend and soul mate for believing in me (yet again) and providing sustained encouragement, love and support.
- My promoter Prof Dr P S Kruger, for the personal interest taken and making a special effort to direct and guide me to bring this work to finality.
- My friend Mike Hare, who planted the first seeds of the ‘systems approach’.

THANK YOU



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SAMMIES

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“You cannot discover new oceans unless you have the courage to lose sight of the shore”¹

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¹ Anonymous



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Chapter 1

THE SCOPE OF THE RESEARCH

1.1 INTRODUCTION AND BACKGROUND

“The one real object of education is to leave a man in the condition of continually asking questions”¹

Bishop Creighton

¹ The quotation is taken from a speech given by Bishop Creighton at the Synod of the Diocese of the Holy Trinity, Toronto, Ontario, Canada, in 1870. The speech is published in the *Journal of the Synod of the Holy Trinity*, Toronto, Ontario, Canada, 1870, p. 10. The text of the speech is also available in the *Journal of the Synod of the Holy Trinity*, Toronto, Ontario, Canada, 1870, p. 10. The text of the speech is also available in the *Journal of the Synod of the Holy Trinity*, Toronto, Ontario, Canada, 1870, p. 10.

¹ Quoted in C.A. Alington: *Things Ancient and Modern*