



UNIVERSITEIT VAN PRETORIA
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A STRATEGIC INDUSTRIAL ENGINEERING PHILOSOPHY

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DEDICATION

To Ciska, my inspiration, my companion and my wife.

THESIS SUMMARY

A STRATEGIC INDUSTRIAL ENGINEERING PHILOSOPHY

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Economic and productive utilisation of natural resources are central to fundamental *Industrial Engineering* science, whereas capitalistic corporate *strategy* is aimed at growth of shareholders capital investments made into capitalistic systems of organisations and industries. In this thesis it is established that Industrial Engineering principles are applicable, as a strategic tool, in the economic and productive utilisation of corporate resources such as organisations within unrelated *industries* aimed at achieving the capitalistic corporate goal. In this expanded field



of *Industrial Engineering*, termed *Strategic Industrial Engineering*, scientific engineering knowledge is therefore applied to capitalistic systems with the strategic aim of accumulating capital for the corporate shareholders.

The proposition of this thesis, termed *A Strategic Industrial Engineering Philosophy*, is primarily justified by applying the philosophical principle of sufficient reasoning. Secondary to this, scientific frameworks are proposed that support this expanded philosophy of *Industrial Engineering* by demonstrating the achievement of the capitalistic corporate goal. This is achieved through the following:

- Setting return on equity (ROE) as the scientific measure of capital accumulation;
- proposing a Strategic Industrial Engineering Process, aimed at achieving the capitalistic corporate goal, for further research. This process is based on the following:
 - The relationship between the fundamental strategy and engineering processes; and
 - fundamental corporate performance-regulating principles.
- demonstrating the validity of these performance-regulating principles through explorative statistical analyses.

The proposed *Strategic Industrial Engineering Process*, to be fully defined through further research, is illustrated in Figure 1:

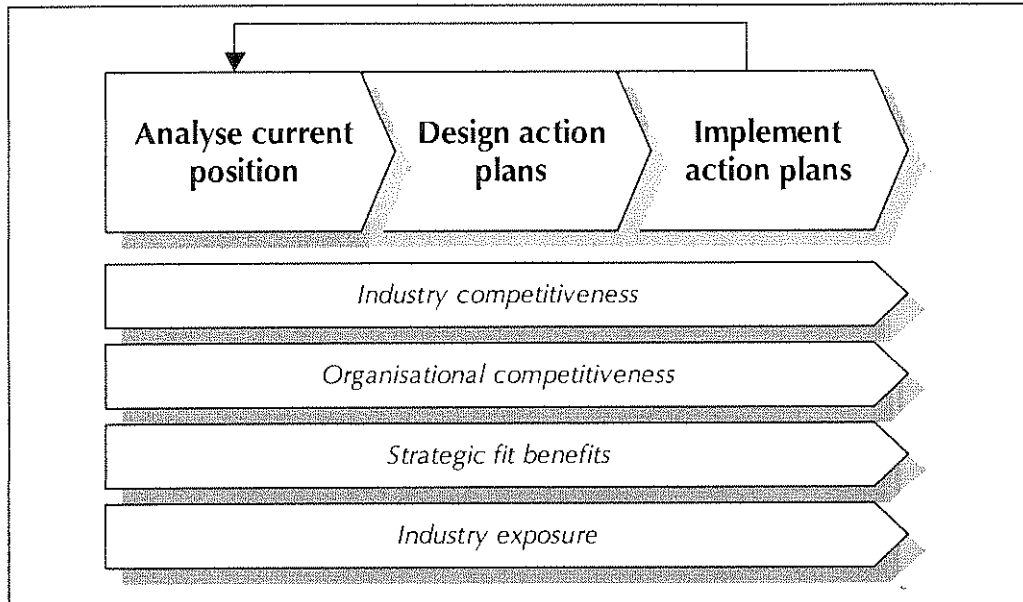


Figure 1: A strategic industrial engineering process

Fundamental corporate strategies are proposed based on applying the *Strategic Industrial Engineering Process* as a strategic tool. These corporate strategies are based on the following, as indicated in Figure 2:

- Organisational competitiveness;
- industry competitiveness; and
- cost of equity.

<i>Above COE</i>	Organisational performans favourable. Further investments in this industry will reduce corporate performance.	Organisational performans favourable. Further investments in this industry will increase corporate performance.
	Organisational performans unfavourable. Further investments in this industry will reduce corporate performance.	Organisational performans unfavourable. Further investments in this industry might or might not increase corporate performance.
<i>Below COE</i>	<i>Below COE</i>	<i>Above COE</i>
		Industry competitiveness <i>(measured in ROE)</i>

Figure 2: Base for corporate strategies

In Figure 3 it is illustrated that the following performance-regulating principles influence the accumulation of capital (ROE) for the benefit of capitalistic corporate shareholders:

- The competitiveness of its individual organisations;
- the individual organisations' accumulation of capital relative to the cost of equity;
- the competitiveness of the industry structures that the corporation is exposed to; and

- strategic fit benefits that improve the corporate performance too more than the average performance of its individual organisations.

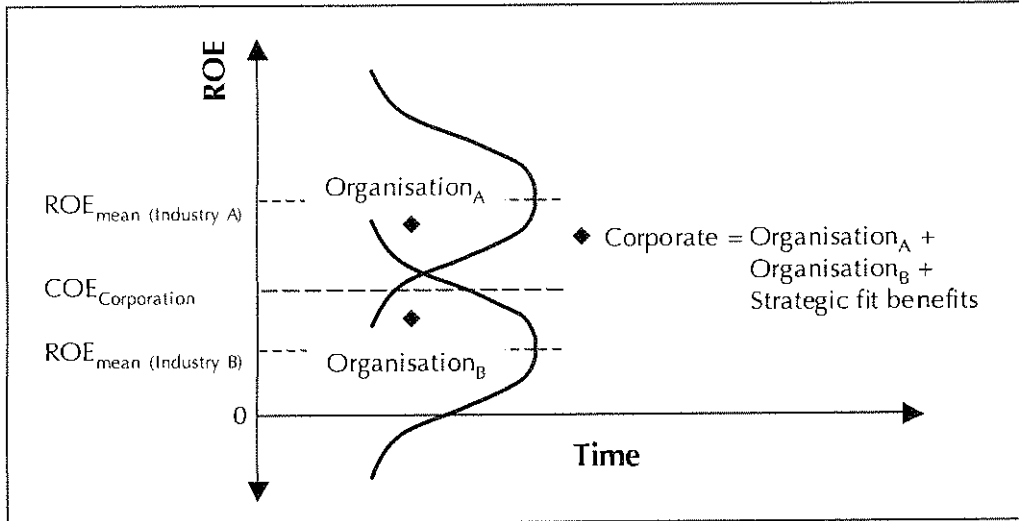


Figure 3: Corporate accumulation of capital

A corporation's accumulation of capital is influenced by the positions of its individual organisations on the industry ROE life cycle. The proposed industry ROE life cycle is illustrated in Figure 4.

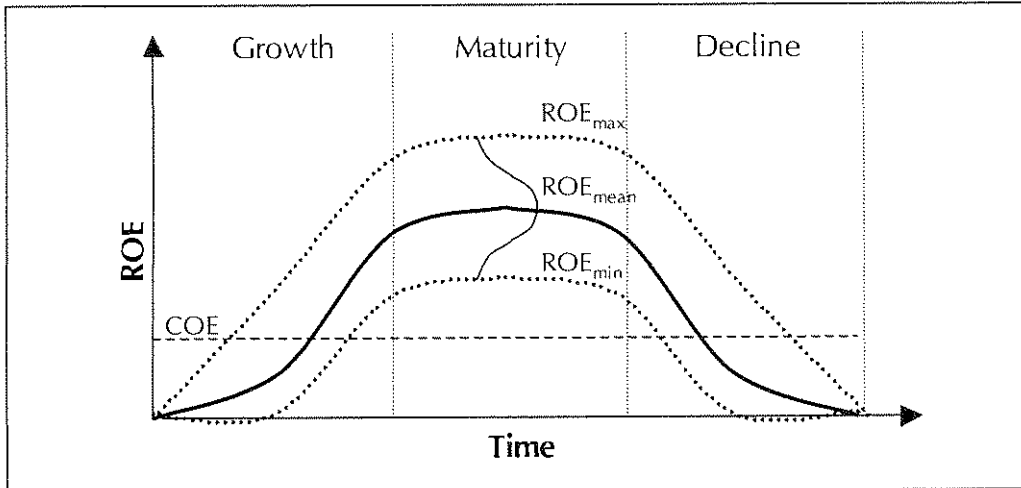


Figure 4: Industry ROE life cycle

Lastly, the foremost intent with this thesis is to establish and demonstrate a specific way of thinking about the role of *Industrial Engineering* in corporate *strategy*.

SAMEVATTING VAN PROEFSKRIF

‘n STRATEGIESE BEDRYFSINGENIEURSWESE FILOSOFIE

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SLEUTELWOORDE: Strategiese bedryfsingeniërswe filosofie,
Strategiese bedryfsingeniërswe; Strategiese
bedryfsingeniërswe proses, Strategie,
Bedryf, Bedryfsingeniërswe.

Die ekonomiese en produktiewe benutting van natuurlike hulpbronne is sentraal tot die wetenskaplike beginsels van bedryfsingeniërswe. ‘n Kapitalistiese korporatiewe strategie het die groei van aandeelhouers se kapitaalbeleggings in kapitalistiese stelsels, soos organisasies en industrieë, ten doel. In die proefskrif word die volgende bevestig: *Bedryfsingeniërswe kan as ‘n strategiese beginsel toegepas word om korporatiewe hulpbronne, soos organisasies in nie verwante industrieë,*



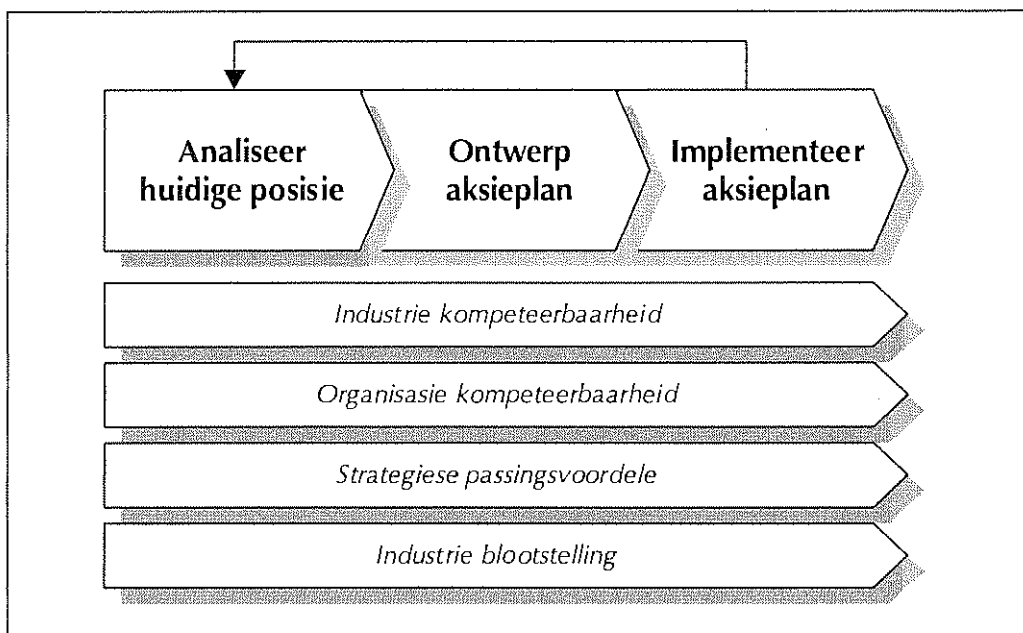
ekonomies en produktief te benut en sodoende die kapitalistiese korporatiewe doel te bereik. Die uitbreiding van die bedryfsingenieurswese veld word uitgedruk as *Strategiese bedryfsingenieurswese*. In *Strategiese bedryfsingenieurswese* word wetenskaplike ingenieurskennis toegepas op kapitalistiese stelsels met die strategiese doel om korporatiewe aandeelhouders se kapitaal te vermeerder.

Die proefskrif se stelling, uitgedruk as; *'n Strategiese bedryfsingenieurswese filosofie*, word primêr geregverdig deur die toepassing van die filosofiese beginsel van genoegsame argumentering. Tweedens word hierdie uitgebreide veld van bedryfsingenieurswese ondersteun deur wetenskaplike raamwerke voortestel. Hierdie oplossing demonstreer die bereiking van die kapitalistiese korporatiewe doel. Dit word gedoen deur:

- Die wins op aandeelhoudersbelang (ROE) te stel as die maatstaf waarteen die tempo van kapitaalvermeerdering gemeet word;
- 'n strategiese bedryfsingenieurswese proses, wat die strategiese bedryfsingenieurswese filosofie toepas om die kapitalistiese korporatiewe doel te bereik, voortestel vir verdere study. Hierdie proses is gebaseer op:
 - Die verwantskap tussen die fundamentele strategiese en ingenieurswese prosesse; en

- fundamentele korporatiewe prestasie-regulerings beginsels.
- die geldigheid van hierdie prestasie-regulerings beginsels word met behulp van eksploratiewe statistiek gedemonstreer.

Die *Strategiese bedryfsingenieurswese proses* word voorgestel vir verdere studie in Figuur 1.



Figuur 1: *Strategiese bedryfsingenieurswese proses*

Fundamentele korporatiewe strategieë, wat gebaseer word op die aanwending van die strategiese bedryfsingenieurswese filosofie as 'n strategiese beginsel, word in die proefskrif gedefinieer. Soos voorgestel in Figuur 2 is hierdie strategieë gebaseer op:

- Organisasie kompeteerbaarheid;
- industrie kompeteerbaarheid; en
- die koste van kapitaal (COE).

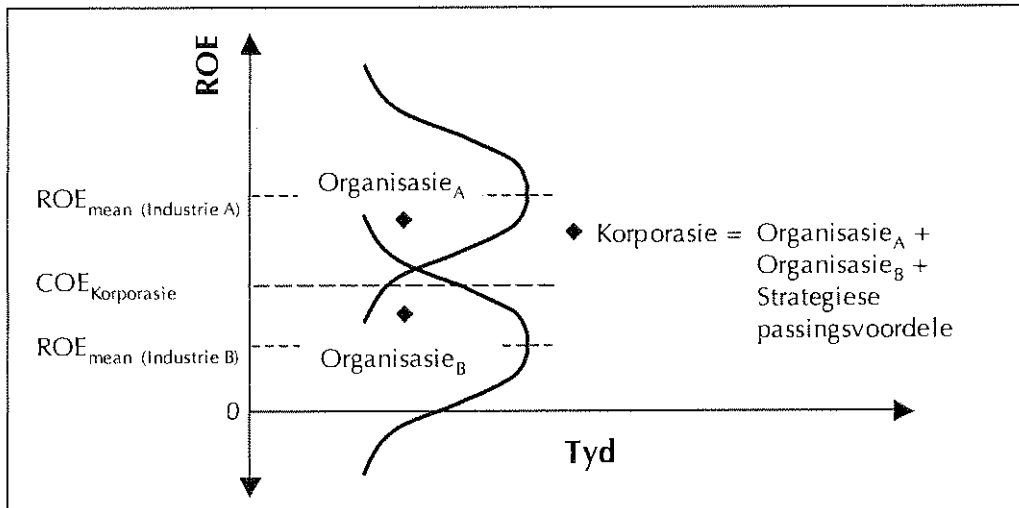
Organisasie kompeteerbaarheid (gemeet in ROE)	<i>Hoër as COE</i>	Die organisasie se prestasie is gunstig. Verdere beleggings in hierdie industrie sal die korporatiewe prestasie verlaag.	Die organisasie se prestasie is gunstig. Verdere beleggings in hierdie industrie sal die korporatiewe prestasie verhoog.
	<i>COE</i>	Die organisasie se prestasie is ongunstig. Verdere beleggings in hierdie industrie sal die korporatiewe prestasie verlaag.	Die organisasie se prestasie is ongunstig. Verdere beleggings in hierdie industrie sal die korporatiewe prestasie verhoog of verlaag.
<i>Laer as COE</i>	<i>Laer as COE</i>	<i>COE</i>	<i>Hoër as COE</i>
Industrie kompeteerbaarheid (gemeet in ROE)			

Figuur 2: Basis van korporatiewe strategieë

Figuur 3 illustreer die stelling dat die volgende prestasie-regulerende beginsels kapitaalvermeerdering (ROE), van die kapitalistiese korporatiewe aandeelhouers, beïnvloed:

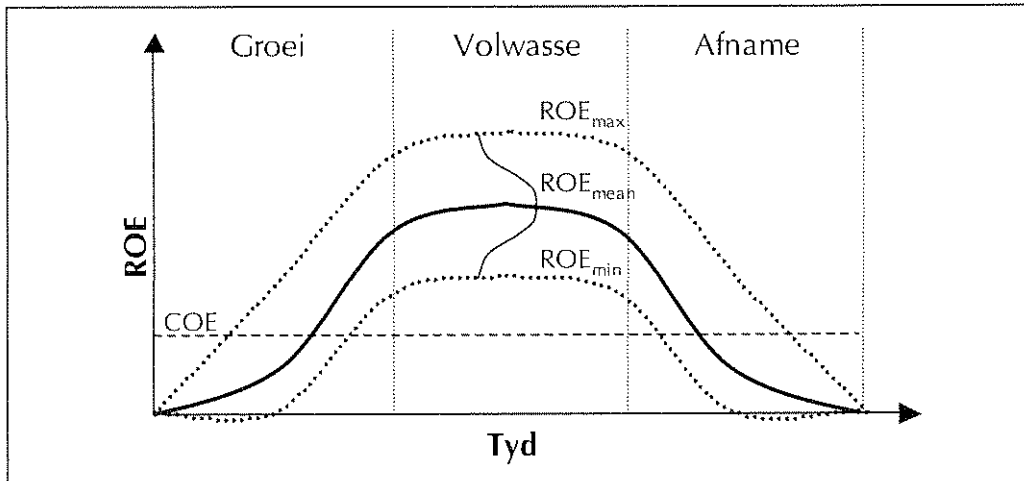
- Die kompeteerbaarheid van elke individuele organisasie van die korporasie;
- die kapitaalvermeerderingsvermoë van hierdie organisasie relatief tot die koste van kapitaal;
- die kompeteerbaarheid van die industriële strukture waaraan die korporasie blootgestel is; en

- strategiese passingsvoordele tussen die korporasie se organisasies wat die gemeenskaplike prestasie van die korporasie hoër maak as wat die som van die individuele organisasies se prestasies is.



Figuur 3: Korporatiewe kapitaalvermeerdering

Die korporatiewe kapitaalvermeerdering word verder beïnvloed deur die posisie van die organisasies op die industriële ROE lewensiklus. Die industriële ROE lewensiklus word voorgestel in Figuur 4.



Figuur 4: Industriële ROE lewensiklus

Laastens, die belangrikste bedoeling met hierdie proefskrif is om 'n spesifieke manier van denke, oor die rol van bedryfsingenieurswese in korporatiewe strategie, te vestig en te demonstreer.

ACKNOWLEDGEMENTS

It is customary to acknowledge all sources in an academic writing by ending with an exhaustive bibliographic list and to provide up-front acknowledgement of its forbearers for their responsibility in the final result. In this, however, one fails to thank people appropriately for their contributions and it fails to mark the real sources of ideas so that readers may understand the origins of an academic manuscript. Perhaps our style is to revert to laundry lists because such origins are always difficult for the author to fully recognise. Although I will endeavour to personally thank those who in writing or in person have helped me to fashion this thesis, I would like to highlight the following contributions to the readers of this manuscript:

- Our Creator for making this possible;
- my wife and family, for their inspiration, support and sacrifices;
- professor Paul Kruger, for his guidance in fashioning this thesis;
- doctor Mellet Moll, for his contributions to this document and his mentorship in my personal development;
- professor Deon van Zyl and Mike van der Linde, Department of Statistics University of Pretoria, for the statistical analyses used in this thesis; and
- Bureau of Financial Analysis, for supplying the data used in this thesis.



PROLOGUE

"All men by nature desire to know."

Aristotle



For true academic scholars, life constitutes a journey in search of knowledge that is founded on unshakable truths. I believe this journey starts the day one opens one's eyes to the world. Seeing an unknown face to find that this is the face of one's mother, one's cornerstone for nourishment, security and comfort. Hordes of people might pass through life unaware of veiled mysteries and untold truths. They who do experience this realisation are the lucky few. This desire to know is the central theme throughout this thesis. My own desire to understand the inter-relationships between various spheres of life is to me, the foundation of this work.

In its existence mankind has, through the application of this knowledge, created various disciplines, each aimed at satisfying specific human needs. Viewed superficially, these disciplines might appear to be mutually exclusive. My perception is that unique people, with unique personal characteristics, exist within each of these disciplines. For example:

- Artists are primarily dreamers;
- theologians are primarily humanists;
- businessmen are primarily capitalists;
- medical practitioners are primarily philanthropists; and
- technologists are primarily intellectuals.

This observation, that these disciplines are mutually exclusive, is most likely exaggerated, as relationships and similarities between these disciplines do exist, although this is probably based on individual perception. Exploring the relationship between the disciplines of technology and business is the central idea of this thesis, as I am, in my professional capacity, involved in both the technical and business disciplines. The driving forces behind this desire to explore knowledge, and gain wisdom, within this specific intersect come from my experience and moulding through mentors, authors and role models.

Our existence consists of physical, emotional and intellectual activities. These intellectual activities are by and large involved in three spheres of knowledge that is aimed at satisfying mankind's curiosity with finding the truths of its existence. These three spheres of knowledge are:

- Mythology;
- philosophy; and
- science.

These spheres of knowledge are illustrated in Figure 5.

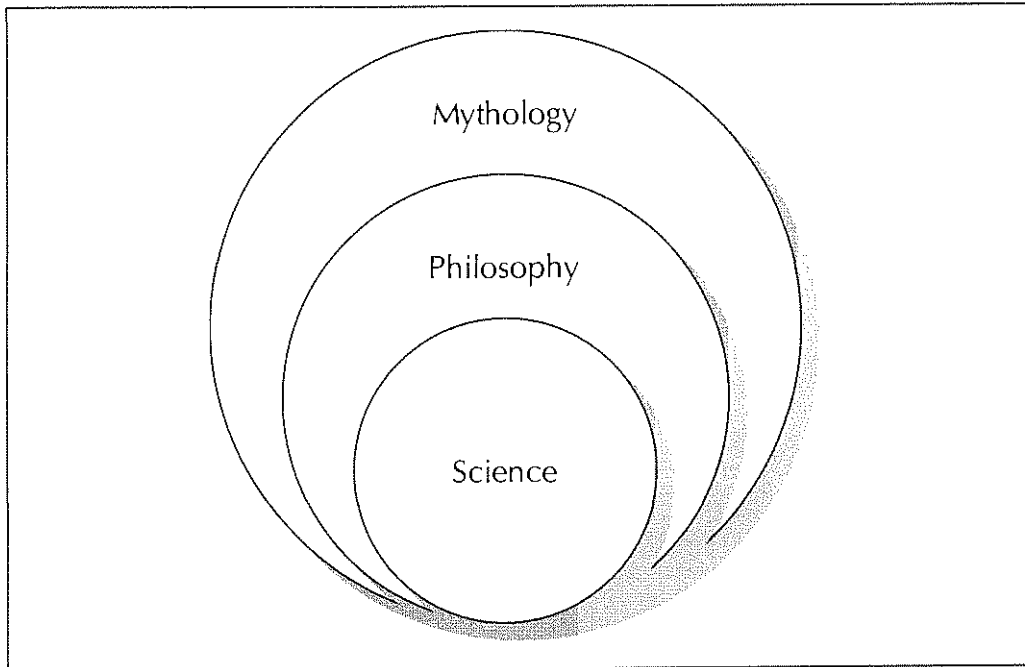


Figure 5: Spheres of knowledge

In this thesis, knowledge is primarily sought on a philosophical level, as opposed to mythology or science. As it is the foremost intent with this thesis to describe a specific way of thinking about the application of Industrial Engineering (technical) skills in corporate strategy (business) and by doing this expand our knowledge.

I hereby submit this thesis as my own original work.

Pierre Leonard

June 2003



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