# Addressing the Dearth of Management Science in the Covid-19 Pandemic [1]

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## Abstract

There have been significant shortcomings in the approach in dealing with the ramifications of Covid-19. This article makes recommendations regarding the approach to be applied by those responsible. The herein proposed independent strategic policy advisory (SPA) units – ideally one in each country dealing with Covid-19 – are central to the approach. It is further essential to apply the proposed pharmaceutical product research and innovation development (RID) project model as part of the SPA system, so as to ensure knowledge creation through innovation and to deliver the trust and openness required to serve and satisfy society.

## INTRODUCTION

Effective and efficient management science is predicated upon the three pillars of ethics, responsibility and sustainability, and the attendant management functions of leading, creating, implementing and improving. The management function of leading assumes the number one spot in the prevailing Industry 4.0 economy and, as the late General Colin Powell once said: “Leadership is the art of accomplishing more than the science of management says is possible.” The 21st century has brought with it a higher consciousness evolution, and the human race is witnessing a rapid technology revolution as well as other revolutions on many frontiers. A sound application of the principles and techniques encompassed in the functions of creating (which involves planning and organizing) and implementing (which involves monitoring and control) is as fundamental as ever in managing projects. Finally, improving is particularly vital since it is the management function that promotes systems thinking and applies total quality

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management (TQM) philosophy in continuous improvement and knowledge management.

Leadership has on the one hand a strategy focus, and on the other hand a people focus. Having a strategy focus is about positioning an organization in the internal and external environment to ensure that it adds value to itself and society in a responsible and ethical manner. Leadership entails a creative journey with people, and ensures that people operate in high-performance teams created by placing the right talents in specific roles as the situation demands. Human capital is recognized as the foundation of value creation. Leading and building on the strengths of human capital means having a solid understanding of people and their relationships, and building on their cognitive and conative talents. Importantly, the people focus extends to the benefits accruing to society from achieving the strategic objectives resulting from sound leadership.

Since society and markets are interlinked through continents and trade, no single micro-economy can escape the impact of the world macro-economy, fluctuating currency rates, inflation, or other ramifications resulting from poor leadership and management. Hence, through sound role-modelling and actions, leaders should take great care not to negatively impact economic and social stability. An inability to conform to these values and principles generally results in uncoordinated and unintegrated actions where people focus on their own agendas and objectives without due regard to the greater context. This inadvertently leads to a dearth of ethics, responsibility and sustainability that proves detrimental to society and the economy, as is evident from the ramifications occurring in the Covid-19 situation.

Around the world, the Covid-19 pandemic has been marked by the absence of a formal strategic policy development unit to integrate and coordinate important facts and information flowing from research results of pharmaceutical manufacturers, research institutions and a host of other sources. This shortcoming resulted, and continues to result, in disparate and poorly managed opinions, actions and policies that have led to confusion and serious social, economic and legal ramifications. The present article discusses the features of the type of formal strategic policy development unit that should have been created by each country in dealing with Covid-19.

Due to not being professionally managed, there has been a distinct failure to achieve the objective of mitigating the serious problems that have occurred. Factors leading to this failure need to be analyzed and optimally addressed. It must be borne in mind that all medical therapeutics and vaccines are in reality project-managed research and

innovation development initiatives that should include sound metrics with respect to their quality and safety for human consumption. Especially considering their nature, these are required to be highly ethical and responsible innovative endeavours.

Success in managing any initiative relies predominantly on leadership quality (as discussed above), how the organization for the initiative is shaped, and applying the skills and acumen for sound project, program, technology, innovation and knowledge management, organized into a professional value-driven system. Work must be progressively performed in organizational supply chain and project portfolios organized into cross-functional program-managed structures that are linked to virtual networks of partners for the purpose of collaboration, coordination and integration.

**BACKGROUND TO THE SITUATION**

Having strategically alert leadership on board in organizations is crucial in positively influencing internal and external activities. Steyn and Semolič (2020, May) assert that the foundation of dynamic capability is embedded in an organization's values, beliefs and guiding principles (constituting the value system) and its leaders' effective role modelling abilities to create paradigms and structures that motivate managers and followers to effectively and efficiently achieve strategic benefits. Trust and openness, combined with knowledge-rich systems thinking, are paramount. Knowledge creation through innovation is indeed a primary manifestation of openness. If openness and trust are not maintained and respected, disastrous consequences can ensue.

Innovative development initiatives are profoundly important in dealing with serious problems, causes and ramifications. The authors herein focus on the dearth of sound leadership, and project, program, technology and knowledge management, in two main areas in the context of Covid-19: firstly, policy development and implementation by public authorities, and secondly, product development and commercialization by private pharmaceutical entities. Policy development (and the effective implementation thereof) is a public-sector responsibility of governing authorities. They have a duty to manage policy development and implementation effectively and efficiently so as to mitigate any risks to which the public is exposed at any time. Sound product development is essential in the case of pharmaceutical products. Both public and private entities have a duty to practice excellent leadership, management and governance in exercising their responsibilities, and need to create effective and efficient structures and systems for this purpose.

Leadership excellence is vital in these endeavours. The current Industry 4.0 economy is highly collaborative in character, and a super-transformational leadership style is proving to be increasingly necessary. Steyn and Semolič (2016, 2017) refer to the fundamental need for "collaboratist" leadership in the prevailing Industry 4.0 economy and regard it as the most important strategy that modern day organizations can employ to achieve superior performance. Collaboratist leaders place a high emphasis on being people-orientated by creating mutual respect and trust with followers. They are indeed super-transformational, focussing on continuous improvement and displaying a desire to serve communities while uplifting the whole.

Collaboratist leaders are committed to fostering an environment that encourages professional, personal and spiritual growth. They focus on *listening* so as to identify, understand and clarify the needs of individuals and teams, and have the ability to foresee future outcomes associated with a situation. Collaboratist leadership is a key aspect of dynamic capability, especially in building and driving innovation, and is critical for mitigating complexity and risk as seen with the Covid-19 situation.

Steyn and Semolič (2020) stress that innovative governance and creative program-managed cross-functional organizational structures, led by collaboratist leaders, should be combined with virtual networks of partners to promote collaboration and synergy. Effective and efficient cross-functional and inter-partner management of supply chain and project portfolios, combined with virtual networks of partners, are critical factors for success. Partners may be small, medium and large organizations, and include knowledge workers. The above are ideal vehicles for delivering the collaboration, integration and coordination for mitigating complexity and risk, while achieving vital advantages and value.

Structural strategy pertains to improving organizational architecture and design with the aim of creating new relationships for achieving high performance. In the current Industry 4.0 economy, project and program management play a central role in strategic and operational governance and are the proverbial "blood vessels" of organizational and inter-organizational supply chain and project systems. Success is embedded in possessing the project management skills that form the foundation of program and portfolio management, and integrating them into a workable value-driven cross-functional organizational system.

As alluded to above, the absence of an independent public-sector strategic policy advisory body resulted in a situation where serious problems and their ramifications have

not been effectively dealt with in the Covid-19 pandemic. It remains the responsibility of government authorities to continuously ensure that humanity is protected against risk. This responsibility includes appraisal of the product safety reports from pharmaceutical manufacturers, as well as appraisal of research reports from relevant scientists and experts. This has not occurred as it should in the context of Covid-19, and the resultant problems have been exacerbated by not having a totally independent watchdog in place.

Pharmaceutical manufacturers are private-sector technology-driven organizations requiring high levels of technology literacy, skills in techno-entrepreneurship and innovation. Importantly, they need to demonstrate exceptional project, program and technology management skills and acumen. All pharmaceutical products are deliverables of research and innovation development (RID) projects performed as part of product development and commercialization processes. Product development and commercialization is an RID process located in the organizational supply chain of entities.

Operationally these processes are engaged in project-managed initiatives that are compelled to conform to stringent project and technology management principles and techniques (Semolič & Steyn, 2018). A profoundly important principle is that each product deliverable must be subjected to stringent appraisal and review. This means that a proper assessment must be made of the product quality and its safety before going to market.

Worldwide the authorities failed to appropriately recognize the Covid-19 pandemic as a complex and high-risk leadership, management and governance challenge. Moreover, manufacturers of Covid-19 vaccines have not been open about the possible side-effects that these products could have. These novel vaccines for the first time in history employ technology that instructs the recipient's body itself to manufacture a part of the virus. Traditional vaccines contain inactivated or attenuated parts or products of the causative agent (in this case a virus) of a disease in order to stimulate the production of antibodies and provide immunity against that disease, without inducing the disease. The novel Covid-19 vaccines instead contain the "instructions" for the recipient's body to produce the spike protein of the SARS-CoV-2 virus. Then, in response to this, the body produces antibodies.

Despite the inevitable absence of long-term safety data for these novel vaccines, members of the general public were given a "blanket assurance" of safety, while at that same time manufacturers were indemnified against liability should any adverse events occur. This dissonant situation has resulted in many people mistrusting vaccines. Manufacturers have acted unethically and irresponsibly by concealing information, as

reported in the media, while still insisting on legal protection against accountability. Contrary to their basic responsibility, vaccine manufacturers have not conformed with the principles of project, program and technology management with respect to systems thinking and knowledge management. This will be further discussed after focussing on the importance of introducing an independent strategic policy advisory body reporting to the governing authorities.

## THE PROPOSED STRATEGIC POLICY ADVISORY UNIT

The Covid-19 pandemic has in certain areas gravely detrimentally influenced the internal and external environments of societies and organizations. The dearth of applying management science is largely to blame for allowing this situation to develop. The management-science-based strategic policy advisory (SPA) unit proposed in the present article is structured cross-functionally as a portfolio of program-managed project initiatives. Every country should have set up an SPA unit to deal effectively and efficiently with Covid-19 pandemic. Although the prevailing state of affairs around the world is such that many opportunities for preventing problems have been lost, setting up an SPA unit could at this point still be of great benefit in addressing the further ramifications of the myriad of problems related to the impact of Covid-19 and the global response thereto.

Guided by project and program management in tandem with technology, innovation and knowledge management, SPA units could, as management science dictates, prove profoundly effective and efficient in developing sound policy for achieving the strategic and operational objectives of countering Covid-19-related problems and ramifications. The proposed unit could be instrumental in providing policy guidance aimed at best mitigating problems that have manifested in the social, economic and legal domains. It is also important to learn lessons from the Covid-19 experience and to ensure that any such situation will be dealt with much better should it be necessary in future.

Change in Industry 4.0 happens rapidly in the external and internal economic environments, demanding high degrees of dynamic flexibility and agility from leadership, management and teams. Dynamic capability, embedded in a sound value system, is required for entities to respond quickly to events in order to maintain quality of service delivery to society. It is undeniable that standing still is tantamount to moving backward in a rapidly changing environment. To keep moving forward, organizations are increasingly dependent on the creative and innovative qualities of their leaders, managers, employees and – very importantly – virtual networks of partners.

The ramification-plagued Covid-19 situation is fraught with ad-hoc actions that failed to deliver beneficial outcomes. Strategic initiatives never succeed if attempted in an ad-hoc fashion. However, where actions are taken in a coordinated, integrated and collaborative way based on the management science principles of project and program management, the success rate can be dramatically improved. Ultimately, coupling program management to a balanced scorecard to create a dynamically capable value-driven system is the key to success. This is attributed to the focus maintained on the strategic requirements of stakeholders and reviews performed by project and program managers based on key performance indicators (KPIs) and critical success factors (CSFs). The strategy map form of the balanced scorecard is utilized for the above-mentioned. Project and program management provide the required framework for implementing strategic initiatives effectively and efficiently.

The proposed advisory system, with an SPA unit at its core, consists of information sourcing, information assessment, and project planning and implementation as illustrated in Figure 1. Information sources acting as inputs to the system comprise medical research, which must include product reports from pharmaceutical entities, and relevant reports from recognized research institutions. In addition to the medical aspects, research reports with respect to psychological, economic, miscellaneous social, and legal information relevant to the situation are essential to scrutinize and assess. The assessed information details must then be provided to the project managers responsible for the final deliverables. The project deliverables are strategic policy advisory guidance documents for action by the governing authorities.


*Figure 1: The Strategic Policy Advisory System*

The management emphasis is on which policies are most critical for achieving strategic goals and objectives effectively. Policy development by authorities is therefore prioritized on the basis of optimal strategic benefits. The vision and mission of the proposed SPA unit must be based on a country's constitution and clearly defined. Goals and objectives to be achieved must be clearly stated. Each strategic policy advisory deliverable should define the actions needed to best benefit society. Once a strategic policy advisory project deliverable has been formulated, it must be presented to the governmental authority for discussion, policy finalization and implementation. Through implementation, the governing authority will introduce actions to best achieve benefits of strategic importance for society and relevant stakeholders.

The governing authority actions follow from the program-managed project initiative deliverables of the SPA unit. The SPA unit value chain schematic is illustrated in Figure 2, and its structure in Figure 3. It consists of two portfolios, supply-chain-based strategic policy advisory operations and projects, and continuous improvement projects. The cross-functional supply chain project work is supported by the cross-functional operations processes of customer relationship management (CRM), customer service management (CSM), procurement, and demand management and capacity planning. Functional

support comes from finance and accounting, economic, legal, psychology, medical and miscellaneous social matters. Performance is measured utilizing a quality management system (QMS) incorporating a balanced scorecard. When required, continuous improvement projects will flow from QMS performance appraisals. Expert informational support for projects is provided by the economic, legal, psychological, medical, and social functional staff.

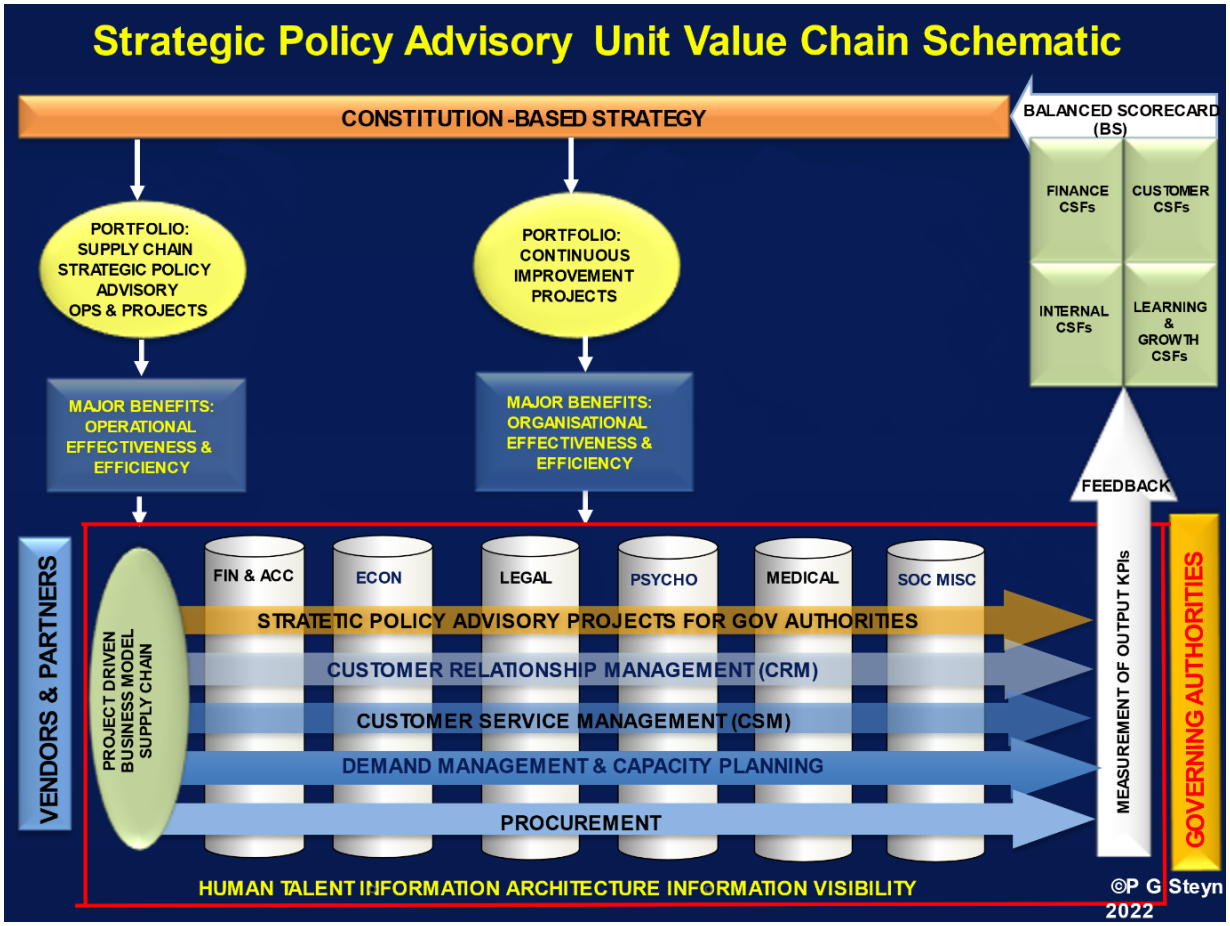


*Figure 2: The Strategic Policy Advisory Unit Value Chain Schematic*

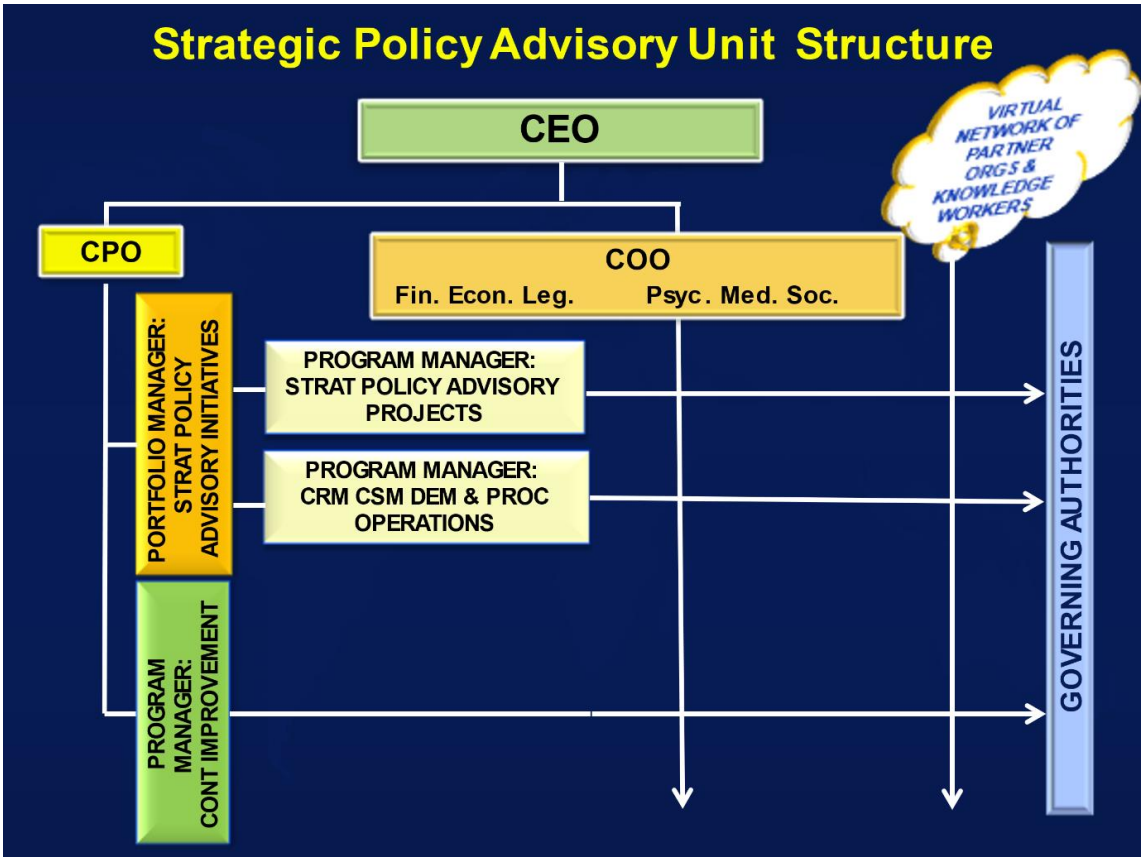


*Figure 3: Strategic Policy Advisory Unit Structure*

The proposed SPA unit is unique in the sense that it does not constitute a permanent office. It could exist for an extended period of time, even several years, depending on the time taken to achieve the objectives. The SPA unit must be staffed from carefully selected human talent as alluded to earlier, since a situation such as the Covid-19 pandemic requires that personal agendas be fully eliminated. The systemic approach of program management copes well with guiding scheduled deliverable objectives to fruition. Its strategic focus handles both environmental volatility and quick responses required in an orderly fashion. By utilizing high-performance teams, accelerated information flow is achieved, which provides the learning and knowledge necessary to inspire innovative strategic success.

Strategic policy advisory initiatives concentrate on doing the right things, i.e., creating strategic policy advice to best achieve the set objectives. The strategic policy advisory process of the proposed SPA unit then follows an assessment and implementation approach as illustrated in the Figure 4 work breakdown structure. The execution of

strategic policy advisory projects guides actions to influence a situation, which often requires that projects not yet implemented be reviewed as time progresses. Program management plays a pivotal role in achieving success with such initiatives. The strategic policy advisory process requires project planning and implementation to be performed as the final stage. Levels 2 and 3 provide a detailed presentation of the activities involved with each of the Level 1 stages.

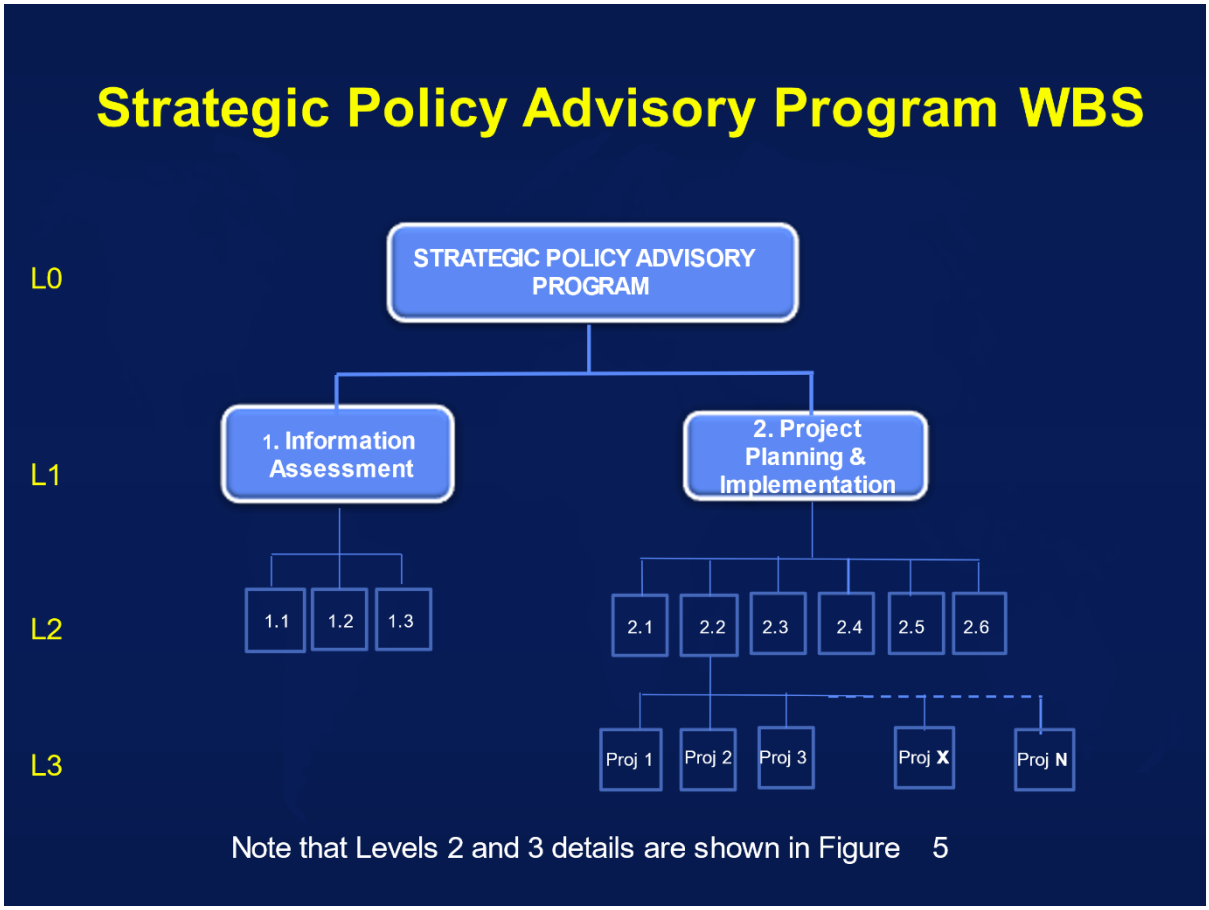


*Figure 4: Strategic Policy Advisory Program Work Breakdown Structure*

Setting up the SPA unit requires proper analysis. Apart from structures it also includes analyzing the available human resource competences to achieve objectives. A constitution-based value system informs the SPA unit's preferred mission and its main goals and objectives. The importance of metrics requires the introduction of the strategy map form of the balanced scorecard. Excellent open communication lines linked to the governing authorities are vital.

As discussed at the outset, by far the most important human resources element is leadership. A Chief Executive Officer (CEO), Chief Portfolio Officer (CPO) and Chief Operations Officer (COO) constitute the executive. Moreover, program managers and functional managers report to the executive as illustrated in Figures 2 and 3. Collaboratist leaders with phronetic intelligence are required to be in control of an SPA unit. Phronetic intelligence enables leaders to cope with complex situations through understanding *why* things are happening, *how* to proceed dealing with it, readily discerning what needs to be done to mitigate risk and achieve performance.

From an execution perspective, collaboratist leaders are also well equipped to identify *who* should be doing the work and *when*. They are generally also blessed with the necessary general project and program management acumen (Steyn & Semolič, 2019). The constitution-based value system must include significant values and beliefs pertaining to ethics and trust, and the total quality management guiding principles of customer focus, human talent empowerment, systems thinking and continuous improvement.

In the conceptualization phase of each project, the focus is on continuously gauging the economic, medical, psychological, legal and/or social environments. This *inter alia* entails gathering a continuous flow of information on a wide range of reports from pharmaceutical entities and research groups/institutions in the private and public sectors. In this endeavour, collaboration with entities and knowledge workers arranged as virtual networks of partners is immensely useful. This is followed by finding the best broad-based strategic policy advisory route forward to achieve the envisaged benefits of strategic importance linked to the objectives.

In the design and implementation/execution phases of each project, the strategic policy advisory initiatives are brought to fruition. Baseline plans for the execution of the prioritized projects are generated. The baseline plan encompasses the scope of work, work breakdown structure, resources required, schedule and budget for each strategic policy advisory project. In sum, each project is systematically taken through its conceptualization and design phases, followed by execution and handover of the deliverable to the governing authorities for perusal and action.

Systems thinking and knowledge management are as important in strategic policy advisory initiatives as in research and innovation product development initiatives. It is imperative that each project deliverable first be measured and appraised to assess whether it conforms with the requirements before being presented to governing

authorities. If the appraisal process indicates non-conformity, the strategic policy advisory deliverable must be reviewed and may even be scrapped. The proposed sequence of performing the activities of the program-managed process for strategic policy advisory projects is illustrated in Figure 5.


*Figure 5: Process for Managing Strategic Policy Advisory Initiatives*

Semolič and Steyn (2018) maintain that the new economy is characterized by digitalized technology and the instability of business environments, demanding continuous inflow of novelties, innovative improvements and change. These authors call for collaboration with networks of partners and finding new authentic business models for communicating and exchanging information and ideas. Transnational research, development and production networks are formed to create temporary associations of specific resources in order to accomplish co-operation to achieve objectives. To achieve beneficial "win-win" performance, collaboration with multiple stakeholders (customers, end-users, suppliers, partners, technologists, scientists, etc.) is advocated.

Accordingly, for optimal effectiveness and efficiency, the proposed SPA unit must operate as a virtual network of partners in an open innovation ecosystem. A virtual organization is a temporary alliance of networked entities and knowledge workers established to fulfil a value-adding task. This integrates and coordinates all activities in a collaborative manner and delivers synergy that enables good relationships between participating stakeholders. The result is a knowledge-based approach that embraces innovation and learning. The proposed management-science-based system would deal effectively and efficiently with strategic policy advisory initiatives and prevent social, economic and legal ramifications as experienced with the Covid-19 pandemic.

## PHARMACEUTICAL PRODUCT RESEARCH AND INNOVATION DEVELOPMENT PROJECTS

Product RID initiatives are projects providing a continuous stream of technical and non-technical novelties. These projects are the responsibility of the product development and commercialization process located in the organizational supply chain portfolio. The technology complexity and value chain complexity of RID projects and business processes are depicted in Figure 6. Technology complexity deals with the technical complexity of the project, while value chain complexity deals with the organizational complexity of the value chain business processes employed. Pharmaceutical vaccine product research and innovation development projects reside in the top right "complex" quadrant of the figure.

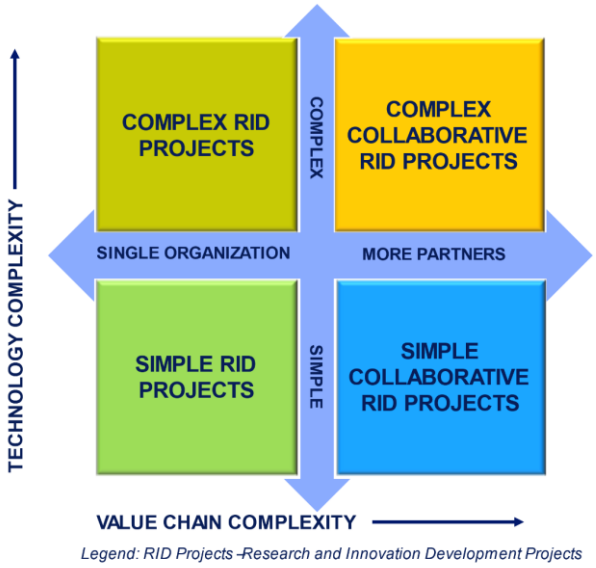


*Figure 6: Complexities of RID Projects and Business Processes (Semolič & Steyn, 2018)*

Manufacturers of pharmaceutical products are compelled to apply technology management in their endeavour to successfully execute product RID projects. Technology management is described by Semolič and Steyn (2017, 2018) as the process of optimizing the use of technology in shaping and achieving strategic and operational objectives, guided by the contemporary management functions of leading, creating, implementing and improving, and imperatively complemented by dynamic capability. Researchers generally regard dynamic capability as paramount in creating performance-rich entities and systems to address dysfunctional bureaucratic practices. Effective and efficient technology management should moreover be project-driven, as partly illustrated in Figure 6 above. Project-driven technology management – viewed through the lens of dynamic capability, as discussed – is an essential vehicle to make effective use of technical knowledge and skills to improve and develop products, services, processes and systems, while generating new knowledge and skills in response to internal and external organizational environmental changes.

Dynamic capability is the ability to reconfigure, redirect, transform, and appropriately shape and integrate existing core competences with external resources, and also with strategic and complementary assets, so as to meet the challenges of a time-pressured, rapidly changing world (such as experienced in the Covid-19 pandemic). The present authors contend that, for pharmaceutical entities to perform as they should, their dynamic capability must be integrated into a technology management framework where the technology management activities, i.e., identification, selection, acquisition, exploitation, learning and protection are linked to core strategy, innovation and operations (projects). By applying supportive open knowledge management, pharmaceutical entities would have, for instance, produced and published vaccine reports to the satisfaction of all stakeholders.

The term “framework” refers to the understanding and communication of structure and relationships within a system or entity for a defined purpose. A technology management framework supports technology management activities operating at any systems level, or in any process. As alluded to earlier, project-driven technology management processes centrally entail innovation and knowledge, necessitating the adoption of innovation and knowledge management. Due to the importance of risk minimization in the context of public health, applying sound innovation and knowledge management is absolutely essential with respect to pharmaceuticals.

Cetindamar *et al.* (2009) resoundingly affirm that project-driven technology management must be viewed through the lens of dynamic capability theory. They distinguish knowledge and technology as different but associated concepts, and contend that knowledge constitutes not only the cognition or recognition (the know-what), but also the conative capacity to act (the know-how), as well as understanding (the know-why) that resides within the mind. Knowledge management aims to add and create value by more actively leveraging the know-how, experience and judgment within and outside of an entity or system. It comprises a range of practices used to identify, create, represent and distribute knowledge for re-use, awareness and learning, all of which are crucial elements in dealing with the ramifications of the Covid-19 pandemic.

According to Semolič and Steyn (2018) opportunities need to be converted into value through effective and dynamic project-driven technology management. They argue that dynamic capability is the object of strategic reconstruction, emphasizing the key role that executives play in applying strategic management in appropriately adapting, integrating and reconfiguring internal and external organizational skills, resources and competences to suit a changing environment. Maintaining dynamic capability requires top management in entities to be continuously strategically alert. It involves recognizing problems and trends, directing (and redirecting) resources, and reshaping mindsets, structures, processes and systems to create and take opportunities while remaining closely aligned with organizational and societal objectives.

Regardless of the type of technological change, managers must link market (customer needs or requirements) and technology capabilities domains. Mechanisms that can support the linkage of customer and technical perspectives include traditional communication channels, cross-functional teams, and business processes. If these mechanisms are in any way obstructed, it invariably has disastrous consequences. When communication channels fail, management fails as a result of information blockages, as indeed experienced with the efforts to cope with Covid-19.

As alluded to earlier and will be further discussed below, vaccine manufacturers failed to conform with some of the central principles of project, program and technology management (including sound systems thinking and knowledge management) in the context of Covid-19. In order to achieve sustainability, it is imperative that lessons be learnt from the Covid-19 experience and that pharmaceutical entities accordingly undergo strategic organizational behavioural, structural and operational transformation and change. The current authors propose that pharmaceutical entities shape their research and innovation development processes as shown in Figure 7.

As discussed earlier, pharmaceutical product RID must be seen as a complex project-driven technology management initiative. The main components in the proposed pharmaceutical RID model are project, program, technology, collaborative innovation and knowledge management, as viewed through the lens of dynamic capability. Each product deliverable must be measured and appraised in terms of quality, and the reports must be carefully scrutinized by executive management and published for purposes of maintaining public trust.

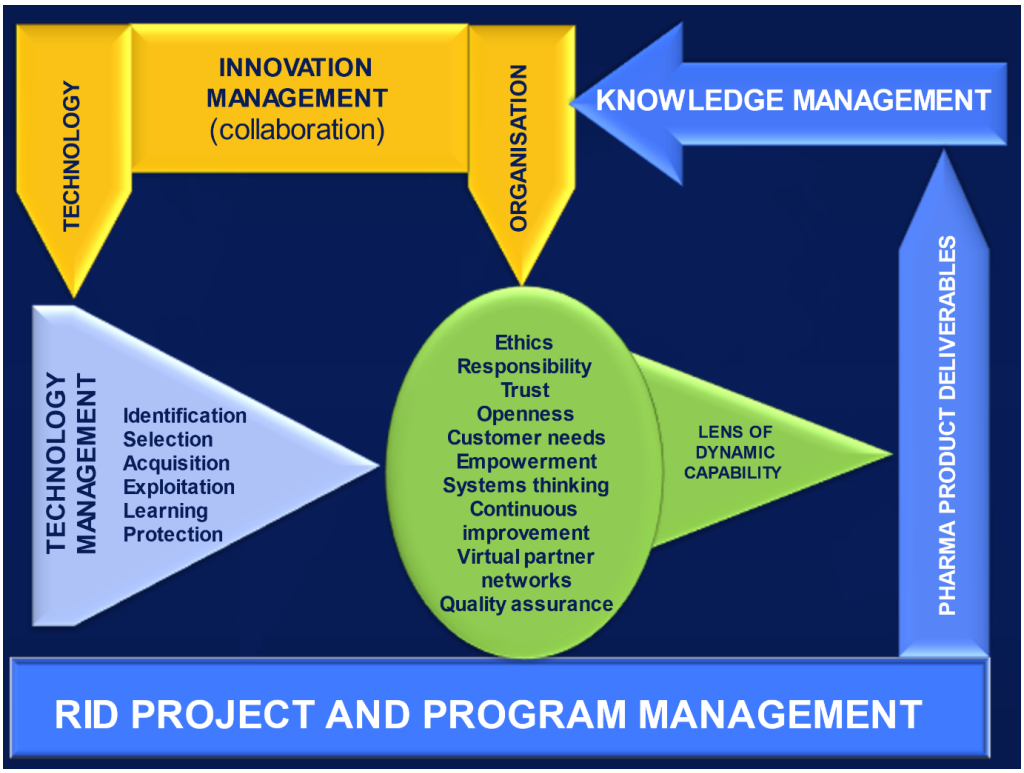


*Figure 7: Pharmaceutical Product Research and Innovation Development Model*

As illustrated in Figure 7, technology management can be performed successfully only if its constituent elements are defined and refined through the lens of dynamic capability, guided by professional project and program management as supported by human talent possessing the necessary acumen. This integrated approach is required in order to succeed in holistically reconfiguring, redirecting, transforming, and appropriately shaping and combining existing core competences with external resources and strategic and complementary assets. As alluded to earlier, the modern economy has seen an explosion of complexity caused by the rapid development of key enabling technologies, products

and processes. Knowledge of and insight into all segments of complexity phenomena are needed to manage them successfully.

Modern project-driven technology management must centrally encompass collaborative innovation and knowledge management. Importantly, innovation and knowledge are not limited to technology, but emanate from many sources, including culture, structure, systems thinking, continuous improvement and quality assurance.

The proposed pharmaceutical product RID model would ensure knowledge creation through innovation and deliver the trust and openness required. As briefly alluded to at the outset in sketching the background to the current situation, openness and trust are critical elements of success in addressing situations such as the Covid-19 pandemic.

## THE APPROACH TO VACCINATION AND EARLY TREATMENT

It is not possible to discuss the full scope of the various problems and ramifications of the Covid-19 pandemic in this article. The authors instead focus on the general approach that should have been adopted in addressing the array of aspects problems and ramifications. In substantiation of the assertion that the approach by authorities around the world has not been appropriate in managing the pandemic, the authors briefly examine two related issues that have emerged as central to a myriad of past, present and future problems and ramifications:

Firstly, there is the phenomenon of what has been termed “therapeutic nihilism”, which is the tendency that has prevailed among medical authorities to maintain that there are no significant therapeutic interventions that are appropriate in the early treatment of Covid-19. Secondly, there is the blindly single-minded policy to “vaccinate as many people as quickly as possible”, regardless of the emerging information regarding safety and efficacy. The specifics of the emerging evidence regarding vaccines and how the strategy should have been adapted throughout the months since January, 2021, are beyond the scope of this article. For present purposes, the two aforementioned aspects are only briefly brought into focus in broad terms so as to highlight the failings of the approach adopted in the pandemic by those in positions of leadership. If the approach herein suggested (*inter alia* employing the STA units and pharmaceutical RID model) were to have been followed, there would have been a balanced approach to early treatment and the deployment of vaccines, carefully considering the emerging information and responding timeously in adapting to the changing situation.

The details regarding emerging evidence in relation to vaccine adverse events are beyond the scope of this article. For present purposes, it suffices to state that these events have not been appropriately dealt with by authorities around the world, since the general policy has been to do everything that can be done to combat vaccine hesitancy. Willfully withholding information from people in the context of vaccines so that one will not "unjustifiably" scare them into not taking a particular vaccine when it is clearly in their best interest to be vaccinated (in the assessment of medical authorities) has been described as the "noble lie". Indications are, however – and evidence in this regard is growing – that financial interests have been placed above the interests of the population and formulation of sound policies in the context of Covid-19 prevention and treatment. During a panel discussion with, among others, Drs Paul Marik and Ryan Cole, Dr Pierre Kory from the Frontline Covid-19 Critical Care (FLCCC) alliance commented on the "noble lie" concept as follows:

"We know that they are manipulating data to preserve [the premise] that vaccines are safe. We generally do not go too much into vaccines (as [we are] an early treatment organization) but we have of late, because we are data-driven… and this [is a serious] data issue…They are manipulating public-health data….[T]hat thought of a 'noble lie'… [M]aybe in the beginning, when we thought that [the vaccines] might be safe and super-effective, and society was ravaged, maybe you could argue for such a 'noble lie'…but once the data started going sideways – and [these have] been going sideways since January 2021 when VAERS [the Vaccine Adverse Event Reporting System] started blowing up – all they have done is persisted and doubled down and tripled down on the 'noble lie'…That lie is not so noble, if it ever was noble …"

Regardless of whether one regards such a "noble lie" to be justifiable or not, it is not legally possible for there to be informed consent if information is being withheld from people. From a legal point of view, such "noble lie" would have to be regarded as justified in a situation of public/therapeutic necessity in order to serve as a substitute for informed consent (which would normally be the legal justification for medical intervention). There are serious ethical and legal questions surrounding the conduct of the authorities and the media in the context of the vaccine rollout. It is submitted that the approach suggested herein would have resulted in a much more balanced approach in which the deployment of novel vaccines developed for Covid-19 would have had an important role to play, but would not have been the blindly dominant drive that it has been. Indeed, from a management science perspective, the approach to vaccination and early treatment should have been an integrated one as part of a holistic strategy, issuing sound guidance

regarding early treatment while adapting the vaccination strategy according to emerging data and the rapidly evolving situation.

Instead of such an integrated approach in which early treatment would have been acknowledged as key in managing the pandemic, the position of therapeutic nihilism has been maintained throughout the pandemic, and has astonished and frustrated many frontline physicians who have been using a host of interventions with great success in Covid-19. Again, if the approach advocated herein were to have been adopted, the information from these physicians would have been processed appropriately and suitable policies would have resulted. Instead, there has been a seemingly unbridgeable divide between the experience of leading frontline physicians and the authorities that are issuing guidance to physicians and patients in general.

In the absence of sound guidance from medical authorities, some physicians have taken the initiative to collaborate in creating and continually adapting early treatment protocols for Covid-19. One such group is the FLCCC alliance, and the evidence available via their website firmly demonstrates how information has been unethically and irresponsibly dealt with by medical authorities and the media from a management science perspective.

It is appropriate briefly to introduce two of the key members of the FLCCC. Dr Paul Marik, who has been instrumental in developing the FLCCC's treatment protocols, is reported to be the second-most published critical care physician in the world, having written over 500 peer-reviewed journal articles, 80 book chapters, and four critical care books. Dr Pierre Kory, who works closely with Dr Marik, has led ICUs in multiple Covid-19 hotspots throughout the pandemic, and has co-authored a number of influential papers on Covid-19, notably also a paper that was the first to support the diagnosis of early Covid-19 respiratory disease as an organizing pneumonia (which is inflammation-based) rather than classic acute respiratory distress syndrome (ARDS), thus explaining the critical response of the disease to corticosteroids.

Dr Kory testified before the US Senate in December 2020 regarding the need to review the data on the repurposed medicine, ivermectin. Related to the paper on organizing pneumonia in Covid-19 mentioned above, he similarly testified regarding the use of corticosteroids in the inflammatory stage of Covid-19 before the Senate. He advocated this on the basis of the available evidence at the time and drawing on the clinical insight and experience of the FLCCC physicians, and did so well in advance of this being satisfactorily proven to be correct, which it indeed was.

## THE EXAMPLE OF IVERMECTIN

The authorities' approach to the matter of ivermectin is a prime example of not applying the correct approach from a leadership and management point of view. Sufficient evidence is required when repurposing an existing medicine for a new indication. However, a major advantage of repurposing a long-established medicine is that one already has a significant amount of reliable safety data. In short, one often has the advantage of being able to know that a medicine is safe while one is still assessing whether it works for a particular new indication.

The notion of repurposing medicines may seem strange to the layperson, especially if the indications are markedly different. It might seem bizarre, for instance, that a medicine that is used to treat parasitic infestations might work against Covid-19. The fact that an antiparasitic medicine could also have antiviral and anti-inflammatory properties is not, however, in itself surprising, since many medicines have diverse properties. Some medicines that were repurposed proved to be of greater use in their subsequent indications than in their original indications. Sildenafil, the active ingredient in Viagra®, was for instance originally intended to be used in the treatment of angina pectoris and hypertension – rather different from the indication for which it has become best known.

The urgency and importance of the matter of ivermectin in South Africa prompted the second author of the present article to become involved in the court application to make ivermectin intended for human use available for off-label prescription. This was indeed a matter that demanded holistic interdisciplinary perspective and insight as well as interdisciplinary collaboration and integration, applying principles of leadership and management in the medicolegal context. From a leadership point of view, deciding what was best to do in the light of the facts and related medicolegal aspects was in the case of ivermectin quite straightforward: It was best to give people the chance of potentially life-saving benefit, while doing no harm.

It is not feasible herein to present the evidence to prove the safety and efficacy of ivermectin. The *safety* of ivermectin (if correctly prescribed) was in fact never realistically in question. Apart from knowing that ivermectin has a very firmly established safety record, one need not know too much about the state of evidence regarding the efficacy of ivermectin to evaluate whether the matter was approached correctly. One need only consider the basic facts in the equation from a leadership and management point of view, applying careful reasoning. As discussed above, managing the Covid-19 pandemic calls

for collaboratist leadership that includes that application of phronetic intelligence. This is central to deciding what is *best to do* in situations in which uncertainty and rapid change are strongly prevalent. Especially in a context where lives are at stake, the need for leadership could not be more pronounced. Apart from the general characteristics inherent in collaboratist leadership, some specific key leadership qualities that are pivotal in a situation such as this are:

1. To listen carefully and to reflect with depth and breadth of analysis and without bias.
2. To view a situation holistically (the so-called "helicopter view") while others may be blinded or blinkered by their intradisciplinary paradigms (akin to functional "silositis" in the context of organizations).
3. Not to be afraid to make the right decision at the right time, even when others cannot yet recognize what is best to do.

It is clear that the above requires both phronetic intelligence and highly responsive collaboration through virtual networks of partners. In contrast, the manner in which the South African authorities dealt with the matter of ivermectin clearly evinced a lack of collaboritist leadership. In December 2020, the South African Health Products Regulatory Authority (SAHPRA) had banned the import or manufacturing of ivermectin intended for humans. Without venturing into details, two serious health risks were created by SAHPRA's decision at that time: firstly, by leaving people to their own devices in self-administering the veterinary formulation of ivermectin or illegally obtained counterfeit or impure medicine, and, secondly, by denying people the chance to benefit from safely prescribed Ivermectin in the context of Covid-19.

After many collaborative efforts, resolution of the issue was confirmed by a court order on 6 April 2021, and doctors in South Africa have since been permitted to prescribe ivermectin for Covid-19 at their discretion. Ultimately, the leaders who were in a position to take early decisive action did not do so, and recourse to the law instead needed to be sought.

What was required from a leadership and management point of view, was to consider the extent of *what is known* about selected repurposed medicines (such as ivermectin) and then to decide *what is best to do* accordingly. In the context of medical science, when one refers to "what is *known"*, one is referring to what one can prove. Standards of proof are different in various contexts, and in medicine the standards are appropriately high. This has the effect that there can be a substantial amount of evidence but still not enough

for it to be accepted as conclusive proof. At the time that decisions had to be made regarding ivermectin, the majority consensus was that there was promise of efficacy, but that the evidence was not strong enough for conclusive proof of efficacy to have been established. Careful, balanced reasoning is required when decisions must be made as to what is best to do at a particular time, even when one would ideally have more evidence. At the point that authorities had to deal with the matter of ivermectin, the following was in fact known:

1. Clear promise of efficacy at the very least, if not at the threshold of universal proof. Albeit that the evidence to date for the use of ivermectin in Covid-19 may fall short of the standard of proof ordinarily required for a regulator to approve its use in this disease, it is a fact that ivermectin has shown significant promise in the context of Covid-19, potentially with life-saving benefit.

2. Proof of safety if used correctly. With quite literally billions of doses of this medicine having been safely administered to humans over decades, it is a very well-studied medicine that has firmly established safe dose parameters. The medicine has been so safe and effective in the context of treating tropical diseases over the decades that its discoverers were in 2015 honored with the Nobel Prize for Medicine, which was reportedly the first such award for the treatment of infectious diseases since six decades prior (Santin *et al.*, 2021).

3. Serious risks related to illegally obtained “ivermectin”. We know that there are serious quality and safety risks associated with “ivermectin” that has found its way to patients via the black market – possibilities in this regard include being contaminated with another substance/medicine and/or not even containing ivermectin. Many people in South Africa had resorted to self-administering the veterinary formulation due to not being in a fair position to be able to obtain the human formulation prescribed by a physician.

Considering the above facts, one could readily resolve the matter as follows: Firstly, consider what is known about efficacy – at the time of the dispute regarding ivermectin, people could have continued *ad infinitum* to debate whether there is enough evidence for conclusive *proof* of efficacy, but the fact was at that time that everyone could agree that ivermectin showed significant *promise* of efficacy in the context of Covid-19. Secondly, consider what is known about *safety* – ivermectin has a particularly good and long-established safety profile. Finally then, consider what is accordingly *best to do* in light of what is known about the promise of benefit and proof of safety. In a nutshell, it was known

that there is considerable evidence that ivermectin has the clear potential to save lives and that it poses no significant risk of harm if used correctly. Such action constitutes good management science.

It is notable that there is no need to argue for conclusive proof of efficacy in order to resolve what is best to do. The thorny and ticklish "scientific debate" regarding the extent of proof of efficacy according to the usual standards, especially as related to the debate around available randomized controlled trial (RCT) evidence and meta-analyses, was not in fact centrally relevant.

Importantly, what the right decision is on the available facts at a particular time does not depend on what is proven later. Having made ivermectin safely available at the time would still be the best decision, even if it were later to have proved not be efficacious at all or only to a small degree. To illustrate, consider the following basic hypothetical-scenario comparison:

Suppose that one uses ivermectin on 100000 people (within the safe doses that are proven) in early treatment, and two months later, it is proven that ivermectin is not efficacious. 5000 of the 100000 people die regardless of having received ivermectin as part of their early treatment. One would have wasted only the money that we spent on the medicine. Other than that – and this is not an expensive medicine – no harm would have been done. Of course, this could not be said if safety were not firmly established (as it indeed was).

Instead, suppose that we use ivermectin on those 100000 people and two months later it is proven that ivermectin reduces mortality by even just 20% (one could consider only mortality for the sake of the example). One would have saved 1000 lives (20% of the 5000 who would otherwise have died). How does one begin to measure that benefit, and how could SAHPRA deny people at least just being given such a chance with a medicine that we know is safe if prescribed correctly?

Apart from the decision based on the practical aspects as brought into focus above, there is also the fundamental principle of respecting the right that people have to make an informed choice regarding their own medical treatment (related to Section 12 of the Bill or Rights of the South African Constitution) and effectively depriving them of potentially life-saving medical treatment (related to Section 27 of the Bill of Rights). It was wrong – especially in a constitutional state based on human dignity, equality and freedom (as explicitly declared in Section 36 of the South African Constitution) – that the human

formulation of ivermectin was being unreasonably withheld from people, leaving them with the choice between foregoing any chance of benefit or taking an illegal medicine or one intended for use in animals.

It should be emphasized that ivermectin should not be seen as “a miracle drug” or “a silver bullet”. Ivermectin is best used *in combination* with other medicines and supplements in an integrated approach to the treatment of Covid-19. The details regarding the combination of therapeutics are beyond the scope of the present article.

A point to note in general in relation to proven or potential agents in the prevention and treatment of Covid-19 is once again the distinct lack of representative information that has been made available to the public by authorities. This lack of guidance from trusted authorities has left people to act on fragments of advice from friends or social media, sometimes with gravely deleterious consequences.

Vitamin D, for instance, is a supplement that has an important role to play in Covid-19. As discussed by Marik (2022), vitamin D insufficiency has been associated with an increased risk of acquiring Covid-19 and of severe disease and death. A balanced approach to vitamin D supplementation should indeed be part of public-health strategy, with information being made available to the public about *effective* and *safe* supplementation. Instead, due to a lack of appropriately provided guidance, there are cases on both extremes: people who are completely unaware that they are deficient on the one hand (with a markedly increased vulnerability to severe disease), and people who take excessively high doses, having “heard” that supplementation would be beneficial, but not knowing that regular high doses necessitate careful monitoring of vitamin D levels so as to avoid toxicity. As always, reliable information flow is key in managing any situation and is an indispensable pillar of good management science.

## CONCLUSION

This article focusses on addressing the dearth of management science in the Covid-19 situation. There have been significant shortcomings in the approach of the various parties responsible for dealing with the countless ramifications of Covid-19. Apart from the host of health and broader social problems, very serious difficulties manifested in the economic domain. Job-losses became rampant, scores of small and medium-sized businesses were impelled to close down, stock-exchanges crashed worldwide, and economic growth came to a standstill. Worse, schools closed leaving children at home and causing working mothers to relinquish their jobs.

Related to the health and social domain, the in-house deliverable appraisals done by the pharmaceutical organizations responsible for Covid-19 vaccine innovative development were all accepted at face value by government authorities without proper independent quality and safety scrutiny. On the other hand, the promising evidence regarding therapeutics aimed at combatting Covid-19, both before and after vaccines became available, was summarily rejected by authorities – once again without formal, independent third-party assessment.

It is important to note that this article does not make recommendations as to *what* specifically should have been done or should be done at this point to ameliorate the Covid-19 situation. Rather, recommendations are made as to *how* the matter should be approached, i.e., the approach in terms of management science to be applied by those responsible in order to determine what specifically should have been done (learning for the future) and should be done now (best managing the continuing ramifications of Covid-19). The proposed independent strategic policy advisory (SPA) units – one in each country dealing with Covid-19 – are central to the approach. It is submitted that applying a sound SPA system would have prevented the confusion and serious social, economic and legal ramifications in the context of the pandemic. It is further essential to apply the proposed pharmaceutical product research and innovation development (RID) model as part of the SPA system, so as to ensure knowledge creation through innovation and to deliver the trust and openness required to serve and satisfy society.

To be successful, each SPA unit must have a cross-functional program-managed structure, must utilize a business model incorporating collaborative virtual networks of partners and knowledge workers, and must have on board collaboratist leadership blessed with phronetic intelligence.

The independent SPA unit, apart from scrutinizing RID deliverable reports, should have no authority over how the private-sector pharmaceutical manufacturers are governed. Nevertheless, vaccine product RID projects are highly complex, and the pharmaceutical entities likewise need to strategically conform to the management science principles of ethics, responsibility and sustainability.

Ultimately, the introduction of a properly structured and staffed independent project-driven SPA unit would be instrumental in enabling authorities to apply management science effectively and efficiently. This would provide the necessary stable environment where ethics, responsibility and sustainability could prevail, and detrimental

ramifications as experienced in the Covid-19 pandemic could as a matter of course be prevented. Moreover, the resulting project-based collaboration, creativity and innovation would positively impact strategic and operational performance, while promoting much-needed systems thinking, continuous improvement and knowledge management.

As an essential part of the SPA system, the pharmaceutical product research and innovation development (RID) project model proposed by the authors serves to facilitate knowledge creation through innovation and delivery of the trust and openness required. The pharmaceutical product RID model would, for instance, have brought into focus the fact that manufacturers of vaccines have to be open about the nature and extent of the possible adverse effects that their products could have on humans. Mistrust could thereby have been prevented without compromising on the protection of intellectual property.

At this point in time, the application of the RID model would result in the cessation of irresponsible and unethical hiding of information, and the related withholding of quality assessments of products. In accordance with their basic responsibility, pharmaceutical manufacturers would be obliged to conform to the principles of project, program and technology management with respect to systems thinking and knowledge management. Moreover, with the knowledge that an independent public-sector strategic policy advisory watchdog is in place, tasked with appraisal of the product ethics and safety reports from pharmaceutical manufacturers, society would feel significantly more comfortable.

## BIBLIOGRAPHY

*Cetindamar D, Phaal R and Probert D. 2009. "Understanding Technology Management as a Dynamic Capability: A Framework for Technology Management Activities", Technovation 29, Elsevier.*

*Marik, Paul, 2022. An overview of the MATH+, I-MASK+ and I-RECOVER Protocols: A Guide to the Management of COVID-19.*

*Santin, AD, Scheim, DE, McCullough, PA, Yagisawa M and Borody, TJ "Ivermectin: a multifaceted drug of Nobel prize-honoured distinction with indicated efficacy against a new global scourge, COVID-19" New Microbe and New Infect 2021; 43: 100924, August.*

*Semolič, Brane and Semolič, Luka, 2021. Virtual Open Innovation System (VOIS) with the Case Study: Partnering Research-Innovation Project ROBOTOOL-1; PM World Journal, Vol. X, Issue VIII, August. https://pmworldlibrary.net/wp-content/uploads/2021/08/pmwj108-Aug2021-Semolic-Semolic-virtual-open-innovation-system-with-case-study.pdf*

*Semolič, Brane and Steyn, Pieter. 2017, "Industry 4.0 Virtual Value Chains and Collaborative Projects", PM World Journal, Vol. VI, Issue IX, September. https://pmworldlibrary.net/wp-content/uploads/2017/09/pmwj62-sep2017-Semolic-Steyn-industry-4.0-virtual-value-chains-featured-paper-1.pdf*

*Semolič, Brane and Steyn, Pieter. 2018. "Industry 4.0 Collaborative Research, Innovation and Development (RID) Projects", PM World Journal, Vol. VII, Issue VIII, August. https://pmworldlibrary.net/wp-content/uploads/2018/08/pmwj73-Aug2018-Semolic-Steyn-Industry4.0-Collaborative-RID-Projects-featured-paper.pdf Republished in the "Russian Project and Program Management Journal", April 2019, Moscow;*

*Steyn, Pieter G. 2001. "Managing Organizations through Projects and Programmes: The Modern General Management Approach", Management Today, Vol 17, no 3, April.*
*Steyn, Pieter G. 2003. "The Balanced Scorecard Programme Management System", Proceedings of the 17th IPMA Global Congress on Project Management, Berlin, Germany.*

*Steyn, Pieter G. 2010. "Programme Managing the Supply Chain Portfolio", PM World Today, Vol XII, Issue VI, Dallas, June. https://pmworldlibrary.net/wp-content/uploads/2015/02/Steyn-2010-June-programme-managing-supply-chain-portfolio-featured-paper.pdf*

*Steyn, Pieter. 2010, "The Need for a Chief Portfolio Officer (CPO) in Organizations", PM World Today, Vol XII, Issue VII, July; https://pmworldlibrary.net/wp-content/uploads/2015/02/Steyn-2010-July-need-for-chief-portfolio-officer-featured-paper.pdf. Republished in the "Journal of Project, Program, and Portfolio Management" University of Technology Sydney, Vol 1, No 1, Australia; Republished in the "Russian Project and Program Management Journal", October 2012, Moscow.*

*Steyn, Pieter. 2012. "Sustainable Strategic Supply Chain Leadership and Management", PM World Journal, Vol. I, Issue V, Dallas, December. https://pmworldlibrary.net/wp-content/uploads/2013/01/PMWJ5-Dec2012-STEYN-Sustainable-Strategic-Supply-Chain-Leadership-Featured-Paper.pdf*

*Steyn, Pieter. 2013. "A Business Model for Programme Managing the Supply Chain", PM World Journal, Vol II, Issue III, Dallas, March. https://pmworldlibrary.net/wp-content/uploads/2013/03/pmwj8-mar2013-steyn-programme-managing-supply-chain-FeaturedPaper.pdf*

*Steyn, Pieter and Semolič, Brane. 2016, "The Critical Role of Chief Portfolio Officer in Governing a Network of Partner Organizations in the Emerging 'Collaboratist' Economy", PM World Journal, Vol. V, Issue II,, February. https://pmworldlibrary.net/wp-*

*content/uploads/2016/02/pmwj43-Feb2016-Steyn-Semolic-Critical-Role-of-CPO-colloratist-economy-featured-paper.pdf*

*Steyn, Pieter and Semolič, Brane. 2017. "Collaboratism: A Solution to Declining Globalization and Rising Protectionism", PM World Journal, Vol. VI, Issue III, March. (PMWJ Award-Winning Article for 2017). https://pmworldlibrary.net/wp-content/uploads/2017/03/pmwj56-Mar2017-Steyn-Semolic-collaboratism-featured-paper.pdf*

*Steyn, Pieter and Semolič, Brane. 2018. "Designing Industry 4.0 Virtual Networks of Partners Value Chains", PM World Journal, Vol. VII, Issue V, Dallas, May. https://pmworldlibrary.net/wp-content/uploads/2018/05/pmwj70-May2018-Steyn-Semolic-industry-4.0-virtual-networks-partners-value-chains.pdf*

*Steyn, Pieter and Semolič, Brane. 2019. "Project and Program Management Acumen: The Catalyst for Industry 4.0 Organizational Success", PM World Journal, Vol VIII, Issue VIII, September. https://pmworldlibrary.net/wp-content/uploads/2019/09/pmwj85-Sep2019-Steyn-Semolic-Steyn-project-and-program-management-acumen.pdf*

*Steyn, Pieter and Semolič, Brane. 2020. "Leading Virtual Dynamic Learning Organizations, PM World Journal, Vol. IX, Issue V, May. https://pmworldlibrary.net/wp-content/uploads/2020/04/pmwj93-May2020-Steyn-Semolic-Leading-Virtual-Dynamic-Learning-Organisations.pdf*

*Steyn, Pieter and Zovitsky, Elzabe. 2018. "The Evolution of Programme Management Towards Governance of Industry 4.0 Organizations", PM World Journal, Vol Vll, Issue III, May. https://pmworldlibrary.net/wp-content/uploads/2018/03/pmwj68-Mar2018-Steyn-Zovitsky-evolution-of-programme-management-industry4.0.pdf*

*Steyn, Roché. 2021. "Ivermectin: How Leadership Failed Us", Leadership Magazine, Issue 425, May.*

*Steyn, Roché. 2021. "Ivermectin: Quo Vadis South Africa?", Leadership Magazine, Issue 426, June.*

*Van den Berg, Julian. Steyn, Pieter and Semolič, Brane. 2018. "Chief Portfolio Officer: The Industry 4.0 Value Chain Change Agent", PM World Journal, Vol. VII, Issue VII, July.* https://pmworldlibrary.net/wp-content/uploads/2018/07/pmwj72-Jul2018-VandenBerg-Steyn-Semolic-chief-porfolio-officer-industry4.0.pdf

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**Dr. Pieter Steyn** is Founder and Principal of Cranefield College, a South African Council on Higher Education / Department of Education accredited and registered Private Higher Education Institution. Cranefield offers an Advanced Certificate, Advanced Diploma, Batchelor of Business Administration degree, Postgraduate Diploma, Master's degree (MCom), and PhD. He holds the degrees BSc (Eng), MBA and Doctor of Commerce, and is a registered Professional Engineer.

He was formerly professor in the Department of Management, University of South Africa and Pretoria University Business School. He founded the Production Management Institute of South Africa, and in 1979 pioneered Project Management as a university subject at the post-graduate level at the University of South Africa. Prof Steyn also taught at the Chung-Shan Institute of Science and Technology in Taiwan as a guest lecturer.

He founded consulting engineering firm Steyn and Van Rensburg (SVR). Projects by SVR include First National Bank Head Office (Bank City), Standard Bank Head Office, Mandela Square Shopping Centre (all in Johannesburg), as also, Game City- and The Wheel Shopping Centres (in Durban). He, *inter alia,* chaired the Commission of Enquiry into the Swaziland Civil Service; and acted as Programme Manager for the Strategic Transformation of the Gauteng Government's Welfare Department and Corporate Core.

Prof Steyn is a contributing author of the "*International Handbook of Production and Operations Management*," (Cassell, London, 1989, ed. Ray Wild) and is the author of many articles and papers on leadership and management. He is a member of the Association of Business Leadership, Industrial Engineering Institute, Engineering Association of South Africa, and Project Management South Africa (PMSA); and a former member of the Research Management Board of IPMA. He serves on the Editorial Board of the PM World

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Dr Steyn holds the qualifications BLC, LLB, HonsBA(Psych), LLM(Med), AdvDip(PM), and LLD. His undergraduate studies combined law and psychology (in the primarily legal BLC degree, with additional courses in psychology and criminology), followed by the simultaneous completion of the LLB degree and Honours degree in psychology (having been granted special permission to complete these degrees simultaneously). He then went on to combine studies in medical law (focusing on malpractice liability in clinical psychology and psychiatry) and management, completing the LLM with specialisation in Medical Law and the Advanced Diploma in Project Management concurrently. He was awarded the *Carmen Nathan Grant of the Unit for Medicine and Law* to conduct medicolegal research in the United States for the purpose of his LLM(Med). The simultaneous completion of the LLM(Med) and the AdvDip(PM) allowed him also to incorporate selected principles of management into his LLM dissertation. He achieved distinctions in each of the requirements for the LLM and obtained both the AdvDip(PM) and the LLM(Med) *cum laude*.

By the time of completing the above qualifications, he had started developing a multidisciplinary consultancy in collaboration with partners who also had interdisciplinary

qualifications, named Multiplin. Part of Multiplin's mission was to create courses for professionals in furthering the cause of integrative multidisciplinary development. On the basis of his performance in his LLM(Med), he was selected to receive the *H Bradlow Scholarship* to support him in his doctoral work on the interactions of law, medicine, psychology and management, with Professor SA Strauss SC as his promoter (at the University of South Africa). Being based in England at the time, he also started teaching part-time at Leicester University (where he taught medical law, tort law and criminal law) and Multiplin LLP was incorporated in England and Wales to further the purpose of promoting integrative multidisciplinary development through consulting and education.

Following successful completion of his doctorate degree (LLD), he was appointed as a Principal Lecturer at Cranefield College, where he then led the successful implementation of Multiplin-developed courses through distance learning, which mode of delivery he initiated at the College. He subsequently assisted the College in the accreditation of its PhD in Commerce and Administration through distance learning, and provided strategic and legal advice in converting the College from a mixed-mode institution (with students needing to attend selected onsite classes) to a full distance-mode institution (with all programs being susceptible of completion through online classes from anywhere in the world).

In his writing, teaching and practice, he steadfastly advocates the need for partnership and integration *between* disciplines (particularly in his specialised areas of medicine and law, and relevant areas of psychology and management) and also holistic perspective and integration *within* disciplines (as is indeed imperative for the different areas within medicine, management, psychology and law).