IPRPD
International Journal of Business & Management Studies
ISSN 2694-1430 (Print), 2694-1449 (Online)
Volume 07; Issue no 02: February, 2026
DOI: 10.56734/ijbms.v7n2a3

INTEGRATING AI WITHIN THE SOT FRAMEWORK: A CASE STUDY IN STRATEGIC VALUE CREATION

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Abstract

Leadership at all levels of a company is fundamentally about making decisions. These decisions can span the range from higher-level strategic initiatives for the organization, all the way down to a specific focus on what customer work to accept (and what not to accept) and how to tactically accomplish this work in the most efficient, performance-focused manner. In between these two points there is a myriad of operational and tactical decisions that link strategic direction, results, and ultimately value creation - the goal of strategy. Today a key strategic question that many organizations face deals with not only technology, but social, and even political undertones: *"what will be the impact of AI on our business and how can we leverage this strategically for value creation?"* This paper presents the concept of the SOT, Strategy, Operations, Tactics, alignment framework, through the introduction and practical integration of Artificial Intelligence capabilities of a major transnational industrial manufacturer of wind turbines. Utilizing PMI's framework for AI, the paper analyzes specific areas affecting business functions and organizational development along the hierarchical SOT framework from top organizational leadership, to major project middle-managers, to tactical line supervisors, in the quest for efficient value alignment and creation throughout the hierarchy of the organization. A key area identified where we have demonstratable results is within customer requirements identification and allocation in large value industrial project orders relating to wind turbine project manufacturing and infrastructure; this was identified as a critical point where the organization was able to leverage AI so that external customer expectations on performance, delivery, and costs, align with internal organizational stakeholders' business expectations and functional necessities and efficient & effective capabilities. Initial improvements realized include an approximate 24% faster project build/delivery rate with a decrease of change orders, down 13%, within the first 18 months of AI capability introduction within the SOT organizational framework. Within this newly-integrated SOT-AI system, we also consider scale effects that impact multiple SBUs with dispersed production control, procurement, engineering, and manufacturing assets in multiple regional areas. We identify specific and practical ways in which the integrated SOT-AI framework impacts results in tactical, operational/system, and strategic efforts and ultimately the enhancement of value and strategic advantage.

Keywords

Strategic Alignment; Artificial Intelligence; Project Management; Operational Efficiency; Value Creation and Strategic Advantage

Introduction: Strategic Alignment Constructs, Challenges, and SOT

This article sets out to provide a practical real-world framework in practice developed within the greater global organization of a well-known international heavy industry manufacturing company. The framework deals specifically with strategic alignment - that corporate activity that for many organizations remains elusive and a primary source of inefficiency and suboptimal utilization of corporate resources. Alignment

in an organization is an integral part of effective strategy execution / implementation. And as is well documented, strategy execution is where many organizations fail. One may develop the best strategy possible within their industry sector, considering external and internal environments and strategic fit, but if this strategy, for whatever reason, cannot be executed (the work effectively and efficiently accomplished), it becomes almost meaningless and of little value to the organization; it may even become a hindrance if it clashes with fundamentals of organizational culture. In addition, a significant number of organizations do not understand if a lack of alignment is the symptom or the cause of strategic failure; we propose that it is both, misalignment acts like a perpetual drain on an organization's resources. Ultimately with the assistance AI we can remedy the issue.

1.1 Defining Strategic Alignment

We define strategic alignment as "*the process by which an institution's strategy is executed by both a direct, structured, and systemized methodology, as well as by a more indirect, organisational cultural approach, so that resources are utilized towards an optimal combination of people, product, process, and strategic goals can be realized in the most efficient and effective manner*." For this to be truly realized it is necessary for virtually every member of the organization to (1) understand the strategy, and (2) understand how their particular work contributes to that strategy ultimately resulting in reaching the higher-order organizational strategic goals. Thus clear, concise, effective communication and rationalization become major components of alignment and execution. We shall see how successful AI integration and utilization within the organization positively contributes to this communication and rationalization thus promoting strategic alignment and ultimately value creation.

Furthermore, our definition of strategy has its foundation on decisions; we define strategy as – *making decision so as to shape one's future towards value enhancement and advantage*. From this simple, yet fundamental definition we can extend the concept further to include alignment. With alignment, organizational leadership needs to constantly make tactical and operational decisions - course corrections, adjustments and internal business calibrations, so that a streamlined approach to execution is as much assured as possible with all aspects of the organization. And, with the introduction of AI, we can allow a portion of these decisions to be made without significant human control.

Establishing a structure to our methodology, we expound our concept of strategic alignment within the construct of Longitudinal (L1) and Lateral (L2) alignment. This refers to aligning hierarchical stratified levels of the organization (L1), usually defined in terms of organizational positions and responsibilities whether tactical, operational and/or strategic in nature; as well as aligning components within each of these layers in a cross-entity approach (L2); for example aligning shop-floor manufacturing units at the tactical level, or aligning production control units at the operational level. This concept ultimately establishes a mesh network of structure, communication, cooperation and rationalization in meeting strategy and ultimately strategic goals. Based on this foundation we can subsequently structure an AI system more easily and efficiently.

1.2 Alignment Challenges in Business

The challenges that organizations face in terms of aligning their resources to serve a chosen unified strategic direction are well known. Significant research has been done on making strategy work despite the normal pressures and forces exerted on a company by multiple segments of stakeholders and even multiple factions within each segment, from employees to entire departments. And, if you consider multiple SBUs this certainly increases complexity. Beer and Voelpel identified specific *"killers"* of strategic alignment and implementation most of which are subtle and can manifest themselves in many organizations to some level or another (Beer & Voelpel, 2005). Some of these include the fact that many organizations lack business discipline which brings about conflicting priorities; lack of cohesion within the top/exec management team themselves; an ineffective leadership style whether it's too direct top-down or too laissez-faire, or even a total lack of leadership skills altogether; and more fundamentally ineffective communication (Chen & I-Jen, 2018), (Johnson, et.al, 2015), (Joshi, et.al, 2003). The communication factor is especially of concern because it negatively affects essentially every other issue mentioned and directly hinders effective remedies in many.

According to Bains and Gwyn a major concern that results from these so-called alignment *"killers"* is that each employee's personal reality in terms of their work within the organization varies instead of being aligned with the corporate direction (Bains & Gwyn, 2005). If this occurs you have misalignment, and when you have misalignment, this occurs - it is essentially a vicious cycle when the

employee or stakeholders either has the wrong idea about where the organization strategically wants to go, or, they see no relation between the work they perform for the organization and how their efforts affects its strategic ambitions and direction. Sometimes they may agree with the objectives to be reached, but disagree with the way to go forward in achieving the objectives. This is a significant challenge – to communicate and have your stakeholders understand what is the direction, how they individually contribute to the corporate strategy whether it is at the staff or factory floor level, the mid-management level or anywhere in between along the SOT hierarchy, and why a particular methodology in achieving the organization's strategic goals moving forward may be the optimal business approach.

Hrebiniak contends that the fundamental core issues mentioned above give rise to an environment itself not conducive to effective execution and the strategic execution process itself has inherent factors which push against efficiency and effectiveness. Strategy alignment and execution requires much more people than simple planning; the entire process almost surely involves organizational change, an area where many organizations simply do not have the professional managerial skills and expertise, even though they may think they do, (Hrebiniak, 2013). Change involves hard systems as well as soft culture skills. Alignment and effective strategy execution take time and during such extended time frames, there is not only planned change but unplanned changes both within the corporate environment as well as the external market – basically a constant state of flux. Almost a constant stream of adjustments must be made, further complicating the process and leading stakeholders to question anything they may feel is out of their control. These are times where organizational silos unfortunately get reinforced and heightened. Alignment, among other things, needs to deal with shortening these silos if not eliminating them all together. Thus, an alignment model needs to be able to guide decisions; develop effective organizational structures that support objectives, foster information sharing, coordination and accountability; establish feedback and control mechanisms, and effectively rely on organizational power structure both formal and informal (Rothaermel, 2017); we feel that the integrated SOT-AI framework is such a model for the future of management.

1.3 Our Alignment Construct as a Foundation for SOT Preceding AI

Based on our L1 and L2 alignment structure introduced earlier we move to define what this specifically means for the organization and how it can be applied in a meaningful way. With L1 we focus on the permeation of the company's mission (M) and vision (V) and its associated strategic goals (G1, G2, G3,…) down to all levels of the organization, this is a similar definition presented by Hough and Liebig (Hough & Liebig, 2013). First and foremost, all members of the company need to understand the strategic direction the organization has chosen to take and how from this certain goals and objectives have been established; L1 is a longitudinal factor.

As we continue longitudinally down the hierarchy the organization establishes key strategies (S1, S2, S3,…) to reach those goals and furthermore specific tactical and operational steps (T1, T2, T3,…) are established that work towards each of these strategies. Two additional elements are of significant importance to this construct – metrics (M), which measure tactical progress, and deliverables (D) which identify specifically what tactical and operational deliverable clearly define the attainment of the strategic goals, i.e., what those strategic goals are set to deliver for the organization. This can also be easily quantified within sub-levels, i.e., the proposed structure can be expanded with ease to define any and all areas of the organization that we desire in preparation for AI integration.

L2 is a lateral factor; it refers to the specific lateral harmonization of goals, strategies, steps, metrics and deliverables within each functional layer of the organizational hierarchy. This can affect single or multiple SBUs, based on the organization's size and geographic operations. So, while L1 measures *alignment depth*, L2 measures *alignment breadth* within the organization. This is an important part of the construct because so-called breadth relates in a practical sense to how well individual components of the organization work together to achieve operational efficiency and *"smoothness"* – the level of ease and effectiveness organizational layers are able to function towards strategy execution and ultimately value creation and competitive advantage. In a sense L2 is also a factor measure of how high (or low) organizational silos are within the organization. This alignment construct foundation is shown in Figure 1.

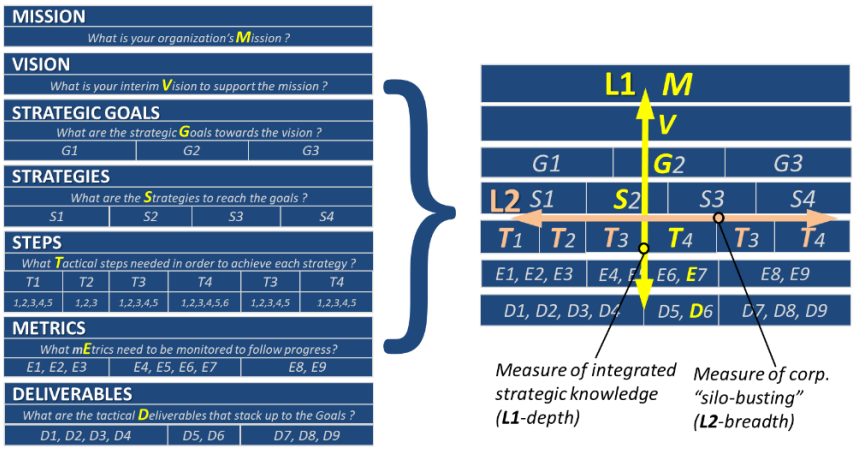

Figure 1. Alignment Construct

1.4 The SOT Framework Model - Strategy, Operations, Tactics

The basic SOT Framework model is shown in Figure 2. It makes up the foundation for the work moving forward by which the alignment construct, previously described, will be utilized to integrate AI capabilities within the organization. The model describes strategic initiatives evolving into operational plans which utilize tactical daily tasks which produce incremental results supporting successful operational project performance, which in turn supports the accomplishment of strategic goals and thus successfully achieving strategy. This is shown as a constant iterative feedback process with a core element being communication clarity and performance accountability.

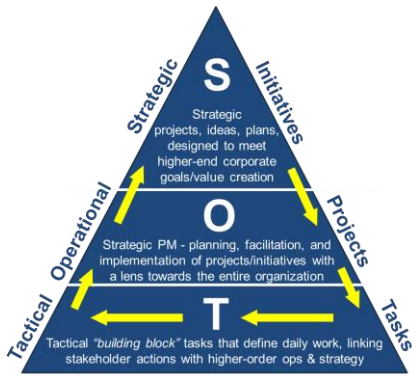

Figure 2. SOT Framework

A primary factor in considering strategic objectives is how these are integrated into the purpose of the organization. Value creation can take multiple forms – is the organization striving for sales growth, market acquisition, profitability? Or, is the organization's strategic/value concept something different altogether? These are questions that need to be analysed thoroughly and developed from conceptual ideas of growth and expansion, into the structural development of strategic objectives, something that AI does fairly well in terms of rationalization. In addition, one of the primary factors to consider at this stage is measurability. When the work begins on the execution of strategy, managers must know if what they are accomplishing has tangible value and ultimately is leading the organization towards its established objectives. This creates a strong bond in the sense of worth and achievement within a critical component of the organization - middle, operational management. Once again, an integrated AI system is well suited for this. According to Hrebiniak, a key aspect of corporate measurability and accountability is the fact that good strategic objectives are never "all or nothing" or "black or white". Instead they must refer to a *".....degree of accomplishment along some continuum of performance...."* (Hrebiniak, 2013). This degree of accomplishment in turn needs to be integrated, thru AI, into an appropriately-logical reward system with effective feedback and learning mechanisms that strive to ensure that the organization is continuously learning, adapting, and improving itself; thus moving towards continuous value creation and ongoing sustainable strategic advantage.

A final consideration with regards to strategic ideas turned into objectives that need to be executed is how well these fit into the organizational corporate culture and what level of professionality does the organization have in terms of its change management systems and processes. How well an organization handles change management directly links with the so-called corporate momentum of strategic execution; it can proceed smoothly and effectively or it can falter, or it may be somewhere in between. This is another area of importance within our case study because multiple organizational and national cultures are involved.

Once conceptual ideas for the organization are formed into strategic objectives; these then must be integrated and defined in terms of execution within the organization's operational plans. This is accomplished through a thorough analysis of strategic linkages. These linkages are both the direct and indirect relationships that the strategic objectives have with one another in how they impact the organization. A relatively simple example would be the desire and objective in strengthening product offerings to the market by augmenting R&D and product innovation. There must be a recognition that the organizational R&D function does not stand alone and that the organization must also consider how it will develop its sales and marketing functions especially in light with new environmental/societal conditions that impact the macro environment as well as the more defined industry segment. It is within such strategic linkages that AI, within the alignment construct, will enable more optimal performance that can expand beyond simpler human consideration; thus a professional project manager within the SOT structure may have at their disposal AI tools that will provide perhaps not only efficiency in strategic linkages, but may even create innovative and serendipitous links and ideas that help the organization towards even greater goals. In this respect and at this particular level of alignment within our SOT Framework, project management becomes critical, as we shall see, in establishing a core mid-organizational level structure on how strategic objectives will be operationalized into corporate-level projects that will define the work of SBUs, sections, departments, and\or work-groups at the lower foundation level driving tactical everyday work/tasks handled by line managers and supervisors. A professional Project Manager (PM) utilizing this framework and incorporating AI tools within it, becomes a powerful organizational change agent driving value creation.

2 Background: Foundational Research in AI

Combining meaningful multi-aspect and integrative research in the areas of strategy, project management, and organizational structure can be a significant undertaking in itself. If we are to integrate into this endeavour socio-cultural factors as researched by Hofstede (Hofstede, 2010) and also bring into the mix the recent impact of AI (artificial intelligence), the work can be truly daunting. Yet this is what we have set out to do in a multi-phased research approach which began in 2009 and continues today. To help visualize this fairly complex framework, consider Figure 3.

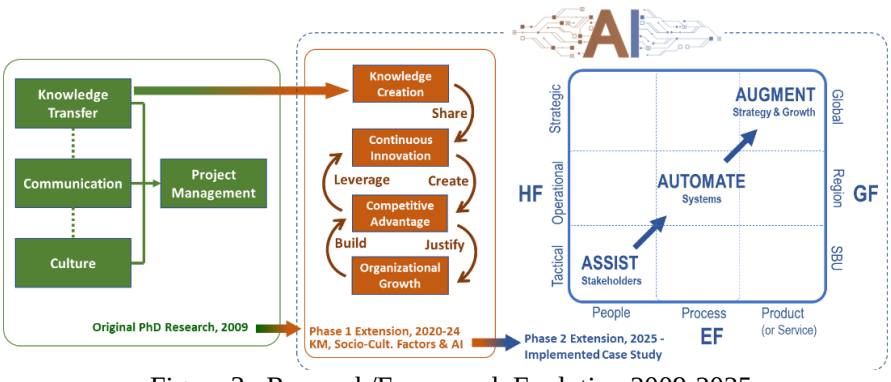

Figure 3: Research/Framework Evolution 2009-2025

So that we can alleviate the complexity to some degree, the practical focus was limited to a particular sector of the market – industrial mechanical power transmission. Most recently with the utilization of our case study, we further refined the work to a particular segment of that market – wind turbine transmission production. Thus, our grand methodology over the past 15 or so years has been of that theoretical establishment on a wider scale with continued refinement to a narrower scope in analysing specifics such as key socio-cultural aspects and AI integration within a strategic and operational role in

directed organizational case studies. This, along with our conceptual SOT alignment model is our way forward to demonstrate actual practical results in our case.

2.1 Algorithm Foundation

The origins for the current case study can be traced back to the original PhD research dissertation previously concluded by the author, (Pantelides, 2009). The objective of that study was to investigate, identify, and analyse the factors and attributes associated with successes of international projects examining cultural and knowledge transfer processes of international heavy machinery companies. The study established a foundation for successfully managing these large-scale projects based on identifying and quantifying communication structures and mechanisms within these manufacturing organizations, as well as identifying and integrating factors between culture and the knowledge transfer chain, and how, in turn, they impact project success. The study further proposed a conceptual framework from which specific attributes were linked to successful projects. The composite model is shown in Figure 4. Key aspects of this model were used to develop the basic algorithms used in the current AI case study. It should be noted that the case study organization presented in this paper was included in the original study of 2009-2010 as well. At that time the original idea of the SOT Framework was also being conceptualized, and over a period of several years 2010-2015, was formalized and introduced into the organization. These were independent projects at the time (prior to the research presented in this paper).

$$\textbf{Project Success} = f\left\{\text{Variables/Attributes based on Culture \& Communication Structure}\right\}$$

$$= f_{cc}[\alpha,\beta,\gamma,\ldots]_{cc} + f_{nc}[\alpha,\beta,\gamma,\ldots]_{nc} + f_{bc}[\alpha,\beta,\gamma,\ldots]_{bc} + f_{ic}[\alpha,\beta,\gamma,\ldots]_{ic} + f_{gc}[\alpha,\beta,\gamma,\ldots]_{gc} + e$$

Where f_{cc} = function of the corp. culture set; f_{bc} = function of the basic comm. set; f_{gc} = function of the group & team set; f_{nc} = function of the national culture set; f_{ic} = function of the international comm. set; e = error term

An amended Variable Utilization Matrix is shone below, corresponding to the Composite Equation.
For the full table, please reference (Pantelides, 2009), page 187.

KNOWLEDGE TRANSFER				
Culture Factors		Communication Structure Factors		
Corp.	National	Basic	International	Groups & Teams
α β β γ γ γ	β β α β γ γ	γ γ β γ γ γ	β β β γ γ γ	α γ β γ γ β

Figure 4: Project Success Initial Model Structure

2.2 Cultural Considerations

In 2020 we embarked on a research initiative that sought to build upon the previous basic foundations described above. This initiative delved into a more detailed analysis of the fundamental factors of Japanese culture - origins and impact in business today. Whereas the original 2009-2010 research took into account certain cultural aspects of the top global power transmission organizations (German, Japanese, Italian and American) the focus was on project management and strategy success primarily with respect to structures of organizational communication. Subsequently we narrowed the focus to international Japanese industrial manufacturers and considered the deep-rooted socio-cultural factors that directly impact the strategic business practices of these organizations today. In addition, we focused on how these are integrated into a knowledge-creating & utilization cycle (for value creation) that positively contribute to organizational success through the novel idea of the SOT Framework. Finally, we introduced the impact of Artificial Intelligence (AI) not only to this deep-rooted cultural framework and its influence, but also on innovation and organizational strategic advantage as the ultimate goal.

The paper (Pantelides, 2024) culminating from this research further considered AI as a leverage multiplier within the author's 3P framework with respect to *People* within the socio-cultural foundation; *Process* within the system of knowledge creation, sharing, and utilization; and culminating in *Product* (and service) innovation that drive strategic advantage. This 3P approach is an important element in the SOP Framework.

Historically being at the forefront of technology, Japanese corporations are integrating AI into their operations and strategically navigating through the resultant labour market transformation that is taking place globally with human-AI collaborative systems. The initiative is an extension of the harmonious relationship, wa (和) and cultural foundation of Japanese organizations - the goal towards productivity using potentially AI-driven Ringi-Seido (稟議制度) systems for example, as well as customer

focus - omotenashi (御持て成し). Furthermore, foundations in relationships, flexibility, and understanding the bigger picture (全体像を理解する) is becoming another focal point. These concepts form the all-encompassing approach at the centre of Japan's socio-cultural core – the *relational view* of the world rather than the *atomistic view* prevalent in the West. This view emphasizes connections/linkages (i.e. integration and alignment), an aspect of which AI is superbly attuned to in optimizing not only from a business sense but well beyond. We conclude with the fact that AI has undoubtedly become a key tool to identify and enable fast decision making and win business over competitors; and Japanese companies, like the one in our case study, with their historical socio-cultural advantage, are set to reap rewards of significant innovation and continued growth, especially when these organizations have a significantly similar hierarchical operational structure to SOT which our case study organization has since formalized.

3 Case Study

The case study presented in this research paper is the result of the author's ongoing professional experience in engineering and project management in the industrial power transmission industry. Over the past two decades the author has been directly involved in large industrial projects within several organizations themselves. In 2022, as manufacturing was ramping back up after the significant COVID impact, a major wind turbine manufacture began investigating efficiency opportunities in their operations. This decision was not originally prompted by the pandemic, but COVID did accelerate this development. This strategic direction would involve the use of robotics & automation on the hardware side, as well as AI on the software side, combining internal resources and capabilities from both alliance-forming companies in Japan and Germany. The initiative, not only to improve operational efficiency, but to become more resilient, proved timely since the interest on AI was gaining significant traction.

The alliance joint-venture organization adopted the SOT structured system previously described. It partnered with a leading international heavy industry power transmission manufacturer with organizational origins and ties to both Germany and Japan to provide a streamlined process for the gearboxes which essentially make up a central core of the turbines (speed increasers to the power generator). Starting with the industrial power transmission side it was decided to incorporate AI within what PMI has identified as the three project management areas of significance: *Assistance*, *Automation*, and *Augmentation*. The goal became to integrate AI so that managing the manufacture, delivery, installation, start-up, and operation of these large multi-million-dollar systems across Europe, would be a source of value creation and strategic advantage for the joint venture. The fact that the SOT and alignment structure had already been established was a significant achievement that was already showing positive results. The question became, how now to integrate AI within the framework to further enhance value creation and strategic advantage.

4 Methodology & Initial Results

The research in the manufacturing joint-venture organization, located in Germany, was conducted based on both a *quantitative* as well as *qualitative* approach. A targeted survey instrument was used to gather data on which a correlational analytical methodology was utilized. This neutral and process-focused survey was internally developed, tailored to the organization's SOT systems, and utilized to identify the state and performance of the organization's project process prior to the introduction of AI and to analyse previous performance data going back approximately 10 years (also through its associate organizations). Within these parameters there were several normalization "*events*" that had occurred in the company that impacted performance including two ERP system upgrades, and two, both related and unrelated, significant organizational restructuring actions of the company's project business. These were appropriately accounted for within the investigation as to their impact on the target metrics. The survey also was utilized to gather data on performance during AI implementation as well as multiple points after key areas of the AI system became operational and started contributing to the project processes. Key areas identified within the survey were segmented based on project timing/schedule, performance, and budget. Under each of these segments, specific measures were identified; refer to Table 1.

The most challenging portion of the analysis was attempting to identify impact during the AI roll-out stage which itself was challenging as a significant organizational/cultural and technological change for the company. We made an effort to identify what improvements, if any, were attributed to the AI tools being introduced vs. what were the project process impacts (positive and negative) due to the major change

going on within the organization at the time of the implementation. In addition to this quantitative approach, we also utilized structured interviews (qualitative) of key personally-involved in the project process. With this portion of data gathering we utilized a vetted interview protocol that attempted to harmonize the qualitative feedback with the quantitative data obtained from the surveys. Initial and intermediate results (2024-2025) are shown in Table 1.

■ Decline ■ Improvement			% From Baseline			Strat. Crit. *			
Proj. Segm.	**Metric** (TQS Syst.Import, F2258.20251008)		**During AI Imp.**	**Post AI Imp.1**	**Post AI Imp.2**	**M**	**A**	**R**	**T**
Timing /Sched.	Time needs for aligning/final project requirements	TR	+3.6	-32.6	-34.9	●		●	●
	Time from RFQ to final quote to the customer	QR	-/-	-30.8	-39.6	●		●	●
	On-time delivery of major vendor components	VT	-6.1	+11.2	+19.1	●	●		●
	On-time delivery of the final project units	OT	-8.5	+21.7	+24.1	●		●	●
Perf.	SBU Service Segment project performance	SP	-3.4	+4.1	-	●			
	SBU Manufacturing Segment project performance	MP	-/-	+16.2	-	●			
	Machine utilization level change	MU	-/-	+22.0	+26.4	●	●		
	Resource utilization level (other than prod. machines)	RU	-/-	+14.2	+21.0	●	●		
	Unit performance – in the field, phase 1, start-up	U1	-0.8	-	-	●	●	●	
	Unit performance – in the field, phase 2, 80% operation	U2	0.0	-	-	●	●	●	
	Unit performance – in the field, phase 3, final norm. op	U3	0.0	+8.1	+11.6	●	●	●	●
Budget	Major Vendor costs	VC	+3.5	-0.8	-1.8	●		●	
	Internal Manufacturing costs	MC	-/-	-7.6	-8.3	●	●	●	
	Total project costs	PC	+6.0	-11.9	-17.5	●	●	●	

* **M** – measurability (given); **A** – attainability; **R** – relevance; **T** – Timeliness

Table 1: Initial and Intermediate Results Summary (2024-2025, R2.)

5 Discussion

The key with such major industrial projects is that they must ensure a positive contribution towards the achievement of the strategic objectives. They need to provide clarity, focus and a direct integrating link of the short/medium term goals with the long-term objectives, as outlined in the SOT Framework. This needs to be done in a systematic (PM) approach of continuous organizational incremental checks and balances towards forward progress, i.e., value creation. This PM function, which appears at the mid-level of the framework within operational projects, is actually critically-binding work of the organization and reminiscent of the middle-up-down approach first introduced in the seminal study on knowledge management *"The Knowledge-creating Company: How Japanese Companies Create the Dynamics of Innovation"* (Nonaka & Takeuchi, 1995). This almost continuously-iterative analysis during major project work, considering revenue potential, actual costs, and time (itself is a cost), is something that AI does well. Thus, utilizing AI, each project's actual work is continuously measured against specific strategic objectives; and, with respect to the actual validation of the project with respect to the strategic ambitions of the organization, factors such as measurability, attainability, relevance, and timeliness are considered (Gallupe & Baker, 2017).

So, the question becomes *"….will the operational project directly impact the strategic objective and if so, how and to what extent?"* This is the starting point and must be considered in terms of specificity and relevance. How are the objectives of the operational project linked to the strategic objects; are they one and the same or subcomponents? Care needs to be taken so as to not have operational projects maintain the same objectives as the overall strategy. This sounds counterintuitive but in effect it is a process of vertical alignment (L1). If operational and strategic objectives are 1-to-1 then the alignment process has not achieved any sort of depth within the organization thus L1 is lacking. In addition, this can also effect lateral L2 breadth in a negative way limiting proactive engagement across areas of the organization. So, specificity refers to how specifically related are the levels' objectives to each other without having them be the same. The organization we analysed establish a spectrum tool to gage this in a quantitative manner with real-time data continuously established by the AI System. Additionally one needs to assess how progress needs to be measured and this must be agreed upon by essentially the entire organization; this also is established by our AI system as a sort of neutral, strategy-focused process.

Attainability is a straight-forward assessment, however many organizations do falter here based on a fundamental aspect of strategic thinking. Strategy is about decision-making and many organization do not realize that making a decision to pursue a certain direction basically means making a decision not to pursue a certain other alternate direction. In essence many companies wish to "do it all" unfortunately this fundamental failure in decision-making the vast majority of times leads to failure in strategic alignment and execution. This thinking needs to be aligned with resources. Falsely thinking a project is "attainable" within the scope of strategic objectives when an appropriate level of resources is not adequately provided leads organizations to a wrong PM path where attainability becomes a fallacy (Coltman, et.al, 2015).

Finally timeliness needs to be considered from a very important and practical point of view – the competitive environment the organization finds itself in. Is the industry, in which the organization's strategic objectives and desires are factoring into, rapidly evolving? Is the market turbulent; going thru constant disruptive innovation, like say certain high-tech markets in recent years? Are there disequilibrium forces applying pressures on the organization to move in a certain direction and move fast? This is where the company needs to honestly reconcile, again its resources with the time pressures to achieve its operational projects so that they effectively contribute to / validate the strategic objectives.

The Project Management Institute (PMI), a professional organization based in the US, has identified three areas that AI can impact within the professional project management practice: *Assistance, Automation, Augmentation,* (PMI, 2023). Our second phase research utilized this basic framework, extending it and encompassing several fundamental organizational interconnected development themes relating to people, process, product - 3Ps previously developed and integrating this within SOT identified initially. The objective of utilizing AI ultimately becomes one of business growth but requires steps to get to that point, such as to: (1) optimize stakeholder support (*Assistance*) and integrate the practical daily tactical steps an organization takes within its business applications relating to large industrial projects; this would build-up to (2) a refined operational efficiency in managing these projects as well as their gradual *Automation*; which would result in (3) the delivery of greater value/growth to the organization (*Augmentation*). Also, as a starting point of the discussion, it is worth mentioning here briefly what constitutes actual project management work overall – *what do project managers do?* Essentially, PMs collect and analyse data, they report information, metrics, and performance, they manage teams and decide a course of action, so that finally a product and/or service can be delivered in a value-creating way - value for the organization delivering and for the customer receiving.

5.1 Assistance: Optimizing Stakeholder Support / SOT Framework T Level

The key aspect of this portion of the research and AI implementation was how the technology can help stakeholders on the PM Team, including the customer. Additionally, we found that AI goes beyond and impacts the stakeholders of the *entire* organization such as tactical line managers in Product & Project Sales, Customer Service, Engineering & Design, and Production Control & Procurement for example.

One of the key areas where AI can benefit both the PM and the organization is in customer requirements allocation – this is the integration of technical constraints with stakeholder expectations and functional necessities. In its simplest form the AI tool analyses tech. specifications and harmonizes these with multiple regulatory requirements. With these significantly-complex industrial projects at hand the end user has a certain set of requirements which must be quantified by their own project manager. Customer needs, which at times may not be exactly clear, must be turned into specific actionable objectives and final designs. What we saw was AI bringing a more optimal and complete trade-off balanced approach among

competing demands. Once this is done, the tool can establish subsequent project tasks with a higher probability of moving through more smoothly. This can be seen in the *Timing/Schedule* results in Table 1 – TR and QR.

Additionally, AI can assist with budget allocation and resource prioritization based on similar past project work-orders as well as what is currently happening in other areas of the organization where resources are also needed; this provides a good interface with the Sales Team in terms of communicating competing priorities. We found this to be a very important aspect because it can directly impact sales-team compensation especially when it's tied to on-time project delivery. Essentially the AI tool will look at the overall situation of the organization and provide a clearer picture of where a particular sales person's project fits into the overall plan. This then can be communicated to the customer and if necessary negotiated at the start.

Task planning and critical path identification are another area where AI has benefited the organization we studied. With these complex projects these activities can become difficult but they are necessary in order to establish a baseline from which metrics can be initiated and measured in order to identify ongoing performance, while minimizing the potential of scope-creep, and progressing through to successful project completion. Data-collecting, analysis, reporting and record-keeping can be made much more efficient and many times can be automated with AI and thus enable the PM to focus more on higher-value tasks such as anticipating potential problems and focusing on positively influencing and motivating the work-team through face-to-face relationship-building. If the PM has the right information readily available at any given time, better decisions are made faster, this adds to their credibility and further motivates the project team. The bottom line is that Project Management is about managing a process but it really comes down to managing people; what AI provides is a tool to alleviate some of the administrative burdens so that there can be a focus on the ***stakeholders*** themselves who are actually involved with the project. We found that real-time status summary communications, including potential project changes, and feedback follow-up, integrated with the organization's Sales and Customer Service Teams, in fact leads to greater customer satisfaction which leads to repeat business. Specific things like AI-generated meeting minutes/summaries, project risk assessments, requirements and regulatory confirmations, that are tailored to project and customer on a regular basis, provide significant levels of assurance that lead to improved satisfaction. Similar to the well-known saying in knowledge management, AI can offer the right information, to the right people, at the right time. Figure 5. provides a simplified process flow for the projects we are discussing as well as specifics in AI integration. Please note that some portions of the figure's text are based on the Project Management Institute framework of definitions, (PMI 2023)

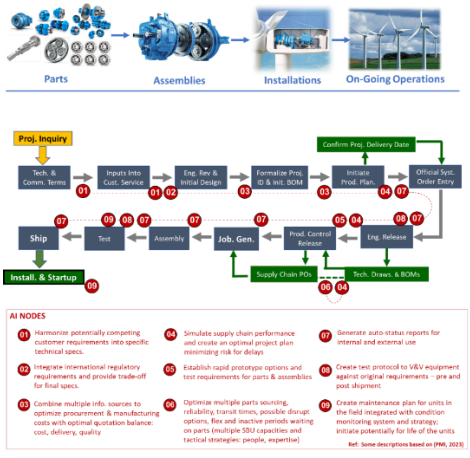

Figure 5: Project Process Flow and AI Integration

5.2 Automation: Refining Operational Efficiency / SOT Framework O Level

The organization took the next step with its AI integration and focused on the impact to ***organizational-wide systems*** that have the potential to positively influence the business beyond a single project. Whereas previously the focus was on stakeholders handling actual daily/tactical work at the base (T, Tactical) of the SOT Framework, now we focus on the SOT mid-level where systems are expanded laterally throughout the organization so as to create this binding effect between what works at the tactical level below for

expansion to positively affect the strategic level above. Thus the work here at the SOT O (Operational) Level becomes very important and strategic in itself. It is where the organization actually goes through transformational change. Here, those members of the organization who have the most knowledge of what makes successful projects (the PMs), are integral to the success of the operational expansion into systems.

We identified ways to utilize AI in tracking and analysing project tasks and costs, and comparing these to budget constraints, we could optimize decision-making. This also held true with customer and regulatory requirements, where these can be continuously compared with the project build in order to offer accurate and efficient options moving forward at each stage of the process. If we expand the scope of these basic AI actions across multiple large projects that the organization could possibly be working on at any given time we have a significantly powerful tool in managing operations. This is shown in several metrics in Table 1, including SP, MP, MU, and RU.

In our research over a period of 22+ months we conducted an actual customer/project load study of 10 specific customers and 15 projects being handled simultaneously across 3 organizational SBUs (Strategic Business Units) having varying capabilities in machining, assembly, and testing. The approximate sales value of these projects ranged from $6.5 to almost $16 million, incorporating a total of 54 units and auxiliary equipment. We could effectively deploy AI tools into all functional areas of the organization, even multiple business units to some extent, and have these utilized across a wide-range of organizational systems affecting almost every customer (not just project customers) with a given order at a given time. Here data collection, analysis, utilisation for accuracy, efficiency, and optimization takes shape within the entire operation's systems. Systems streamlining, modelling, and scenario-planning, as well as predictive analytics and risk management are now embedded not only with each project flow, but across each functional department handling all orders; these include Design & Engineering, as well as Purchasing and Production Control. Although the granularity of this process can be readily considered all the way down to individual machining centre/production cell process times and operator utilization, we need to consider this level in greater detail; it was an area where administrative data had to be re-evaluated in order to provide some level of acceptable information initially. This involved primarily data from Human Resources and there was a component of confidentiality that must be considered.

Reporting here took multiple forms from operational performance insights (internal operations) to Predictive Analytics (external projects). Customers of the information that was provided were not only the actual project customers which we addressed in the *Assistance* segment, customers here were primarily the organization's mid-and-high-level managers and leadership. The goal was to provide options where decisions needed to be made, thus going beyond simple monitoring but moving towards tactical and even higher-level operational action. In addition, the system also provided much more accurate information on overall organizational production loading at any given time. It should be noted here that the company does not have only large project customers, but also smaller customers buying smaller units which also need to be planned and "*fitted into*" the overall production schedule. As one can anticipate, the question in these situations always tends to come down to – *which customers take priority and how do we balance process time under multiple constraints, both internal and external ?* Our AI system has proven a significant tool in making these decisions, albeit with a required "*ranking*" of customers as to their impact on the organization's business. This tends to be somewhat subjective at times however and should be recognized as such. This is an area which requires further study and refinement. The idea of using purely quantitative data and information to rank, vs. qualitative considerations, can in fact be "*programmed into the system*" but in our study case, we did not yet get to this level of sophistication, which also involves a corporate political component as well.

The next step in this gradually-expanding building block system engineering approach is to start considering the organisation's overall value system and optimization of the cost/performance balance including the time factor which directly relates to growth rate. Utilizing AI within the SOT framework and L1/L2 alignment structure created, this becomes somewhat more logical and straightforward in terms of systems analysis and integration, especially with multiple SBUs. As an example, global purchasing resource scheduling and allocation is a major impact here. Raw material like steel, is very important and should be carefully considered. Along with this are decisions on production location which must be balanced with capabilities/quality and once again, overall production capacity loading. Areas still under consideration relating to employee knowledge and capabilities need to be explored and considered more in depth as previously noted. But, the basic question is – *how can the organization "program" data relating to employees within this system so that accurate information on project status within the work flow can be obtained, especially spanning multiple SBUs ?*

Basically, with this "*Automation*" segment what we set out to do is utilize AI to essentially expand beyond a single project to multiple projects within the organization. Adding also potential non-project customer orders that also require process load consideration, and taking into account both internal as well as external constraints (and opportunities), the organization needs to develop effective and efficient systems in production and in fact all business areas. Thus, AI here is used both as a customer-support tool, as well as an internal optimization tool for the organization's processes.

5.3 Augmentation: Delivering Strategic Value / SOT Framework S Level

In considering the further extension and alignment of the AI initiative, we expand into a *forward-looking perspective*, that is, the natural evolution into how AI can contribute to *strategic value augmentation* of the organization; this corresponds to SOT Framework, Level S (Strategic).

Whereas segment *1. Assistance* was focused on project stakeholders, and segment *2. Automation* on organizational systems, the final segment *3. Augmentation* is focused on higher-level forward strategic growth. This segment of the overall AI initiative accounts for the results of the first two and how these integrate into the organization's strategic positioning within a constantly-evolving market influenced by higher-level political, economic (and sustainability/environmental), social and technological factors (PEST) which in-turn impact the direct market pressures as outlined by Michael Porter, (Porter 1985).

Here AI tools were used to select, prioritize, and budget for two distinct types of *new* projects: (1) additional large customer order projects that may reflect an extensive time horizon and for which significant time and resources require allocation (similar to what we previously considered); and (2) internal corporate projects for the organic strategic development of the organization. In certain situations, we found the need to reject potential customer projects as not optimally balanced with what the organization was attempting to do internally. In such cases passing on these project orders (not quoting) was a difficult endeavour especially when the Sales function of the organization may be urging an opposite course of action. AI clarifies and places things into perspective with a range of paths forward from which leadership can choose. The goal is to create an optimal value-time relationship that aligns the growth initiatives and desires of the company by delivering options for greater success with a well-balanced project portfolio. Here AI has been used to limit biases in budgeting when sometimes siloed-departments traditionally compete for funding, and also as a risk assessor with respect to organizational strategic goals and time-frames.

One particular scenario conducted within the scope of the AI integration study in 2024 was the balancing of a strategic multi-million-dollar budget for the SBU, together with 33 internal project initiatives for a 3-5 years' time frame, and 8 external large-scale multi-million-dollar customer order projects that required delivery within 18-24 months. Integrating this work and proposing multiple sequencing scenarios together with probabilities of success and risk assessment, enabled the distinct identification and decision of a specific strategic direction for the organization. It should be noted this was done within the framework and influence of the evolving external market environment and forces which is a significant added level of complexity. Currently we are monitoring the progress of this AI-driven strategic direction based on this balanced project portfolio approach. It is hoped to address this further in the third segment of our study (2026-2028) moving forward.

One particular difficulty we encountered when working with AI at this higher level is the need to incorporate both structured *and unstructured* data from numerous internal but mostly external sources including customers and multiple industry sources. This data needs to be integrated and harmonized so that it can be turned into informational options for decision-making. The obvious solution is utilizing middleware where budgets permit, but for our investigation we combined this with currently a manual approach which does take time and requires further consideration as to overall AI project impact.

However, this process can actually lead to knowledge discovery and promote learning and both product and process innovation within the organization. Ultimately this can enable the company to provide more *customer*-driven solutions and more *customer*-oriented strategies (product and service), something which has been proven to provide a better opportunity for growth and competitive advantage creation. One way this can be achieved is by utilizing customized content creation for high-value target customers and scheduling projects within a close alignment with the organization's business case which enables them to enjoy a higher priority and attention. While this has been done before, it was done manually. With an organization of multiple SBUs around the world, and multiple Sales & Marketing centres, speaking multiple languages, as well as having multiple operational strategies that need to be aligned with a hierarchical corporate strategy, one can see how AI can add efficiency and improved effectiveness to the

overall corporate business process complexity. A similar approach was taken with project life-cycle considerations, that is, managing project units after installation and through their project life – an after-sales service which the organization does provide to customers.

Figure 6. shows the conceptual integration of SOT with what we have discussed in terms of AI. This hybrid SOT-AI Framework is what is currently being used as the foundation for further research and application work in streamlining the integration of this system within the case study organization discussed in this paper.

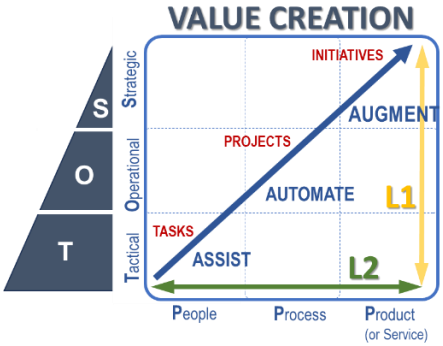

Figure 6: SOP-AI Alignment Value Creation

6 Conclusion And Further Potential Initiatives

AI, so far in this early-to-mid stage of the research, has been able to directly contribute, to various degrees of effectiveness, within the overall planning, execution, and visibility, of very important projects for the case study organization's strategic growth. Forecasting and real-time data has been used to make decisions on value chain operations. Risks, uncertainty, and even potential socio-economic and political threats were considered in potential disruptions to customer projects and company systems. Keeping in mind that there is also an upside to these risks; for example, recently because of the global economic situation, several customers placed significantly large orders with expedited delivery so that potential tariff situations can be minimized. This of course, is a good opportunity for our organization, but also poses a risk in terms of over-capacity utilization /overload. Production machines can only be run up to a point before they must be taken off-line for maintenance for example. This is extremely important especially with heat treat carbonization equipment and ovens – an integral part of several components of these wind turbine gear units.

With respect to the organizational culture, one of the biggest impacts AI made, and that which was identified in the research, was that of the trade-off between Sales and Operations pressures. In many companies this can lead to organizational conflict – the classic Sales vs. Engineering/Tech sub-cultures. In our case study the Sales Team had been known to create unrealistic project demands and forecasts while the Operations Team was blamed on keeping too much inventory; or, the Sales Team had been arguing that it could not meet sales targets because Operations was too conservative in its production planning or Engineering too conservative in design, leading to increased costs. AI established and communicated a much clearer picture of the balance, opportunities, and priorities of the organization. And, in addition to minimizing inventory waste (inactivity) we also utilized a newly-established system to identify additional initiatives in minimizing transportation costs and down-time situations with these fairly large component parts and finished wind turbine units that were shipped to the final installation site. This enabled a far-better understanding of what these large projects required and what was their impact.

On the strategic sourcing side, AI was successful in gathering past data, analysing current and possible future situations, and proposing a way forward with things like supplier performance and production balance (and risk) – directly impacting delivery and quality of projects. We also had a better picture of what parts we could successfully outsource and what we could manufacture in-house based on capacity and schedules.

Finally, and addressing potential areas for our future Phase 3 research initiative, an additional opportunity that has been created with this AI initiative is with respect to our Augmentation Stage and establishing business growth analytics relating to our strategic direction. The Supply Chain Operations Reference (SCOR) model is well known in addressing Reliability, Responsiveness, Agility, Costs, and Asset Management factors and this paper has touched upon these areas even though data is still being

collected and analysed to gage AI-improved performance. Based on our AI initiative, the organization is in the stage of constructing an analytics plan that, together with other operational initiatives within Augmentation, will further transform the company strategically to a higher-level manufacturer where mature, continuously-improving processes and integrated systems, are initiating and driving strategy together with organizational leadership oversight and decision-making.

It is worthwhile to conclude with a note on the role of the Project Manager (PM). We have started to see AI freeing up our PM's so that they can develop better interpersonal soft skills, collaborative leadership skills, and better influencing and motivating approaches, and overall better problem-solving skills for the team. This ideally influences the project team which creates a better pool of project team members and personnel for the organization as a whole. So, what we have started to see is Project Management strengthening under AI not only on the technical side as is clearly evident in this paper, but also on the *human* side. In addition, organizational PMs will better understand how large projects such as these fit within the business itself and its strategy. It is hoped that the PM will develop a better concept of the entire organization and not just a myopic view of his or her own projects only. Deliverables will evolve into a focus on value beyond just the product – value for customers and how this can be integrated with value towards the organization itself. This value mindset can transform the culture of a company and can become a very strong strategic advantage which competitors find difficult to replicate. This is an area for further research that we are considering in our Phase 3 initiative together with the integration of the socio-cultural factors and impact of AI, and solidifying the technical aspects discussed here. Thus, the research vector for the next phase will be three-fold: (1) confirming technical project continued performance based on a specific *analytics metrics structure and ongoing monitoring*, (2) analysing the impact to the *company culture and transformation* especially within the project management teams, and (3) consider further the *development and longevity of strategic advantage* which result from, and are based on, (1) and (2).

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