A Methodology for Performance Measurement and Benchmarking in SMEs

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Abstract – Strategic analysis based on Performance Measurement System (PMS) guidelines allows managers to better plan ahead, communicate, and collaborate. Motivating rational, rather than emotional, discussion amongst team members about strategic options helps ensure that the set goals are understood, that managers are coordinating their teams effectively, and that the set goals are actually carried out. Support from upper management is essential to the success of the performance management process, as is support from managers at all levels. But internal and external factors can influence an organization's goals, leading to shifts over time that strain limited resources and the time managers have available, setting the stage for natural resistance. This paper provides an analysis of performance measurement and benchmarking using the European Network for Advanced Performance Studies (ENAPS) methodology. The ENAPS methodology has been used as a basis for comparing factories because it offers a framework for developing comparable and comprehensive performance indicators.

Keywords – European Network for Advanced Performance Studies (ENAPS), Key Performance Indicator (KPI), Performance Measurement System (PMS).

I. INTRODUCTION

A Key Performance Indicator (KPI) or performance indicator [1] is a metric utilized to measure success; and to analyze how effectively a company or its projects, programs, products, and other efforts are doing. Key performance indicators (KPIs) serve as a focal point for strategic and operational improvement, offer an analytical framework for decision making, and focus attention to the most relevant elements. Sometimes success is described as development toward strategic aims, and other times it is considered a perioding accomplish of specific dimension of operational objectives (e.g., 0 defects, 10 by 10 client experience). Thus, recognizing what is most important to the firm is critical when picking acceptable KPIs. The value of certain indicators varies greatly from department to department. For example, key performance indicators (KPIs) useful to the finance department will vary from those utilized by the sales department.

The selection of performance indicators is linked to a variety of ways for analyzing the present health of a business and its core operations, highlighting the necessity of having a solid grip on what actually counts [2]. Because of the nature of these assessments and the accompanying identification of areas for development, performance indicators are commonly tied to "performance improvement" initiatives. A typical approach for choosing KPIs is to utilize a management model, e.g., balanced scorecard. The significance of such performance indicators is obvious through the typical process of decision-making (e.g., in organizational management). A decision maker who is determining decisions based on multiple options at once should be capable of carefully evaluating the present condition of affairs to correctly forecast the results of those decisions. In case decision makers based the evaluation on insufficient or inaccurate data, their predictions will be off, and they might face unanticipated negative effects. Resultantly, it is critical to use performance indicators correctly in order to avoid and reduce the likelihood of making such mistakes.

The Measurement System for Strategic Performance (MSSP) [3] stimulates the develop of more detailed strategic agenda for business when it is put into action. But getting there requires more than just brainstorming potential routes. To gain an edge in the market, businesses must first determine their long-term objectives and how they will organize their operations and resources. It also details the systems that will be put in place to implement the plan, monitor its development, and evaluate its outcomes. Therefore, it can be deduced that the employment of a strategic PMS has resulted in a synchronization of objectives, measures, assessments, actions, reviews, and learning. To create or maintain a system for measuring the performance of an organization's many stakeholders, including experts, suppliers, customers, managements and operational personnel, the buy-in of upper management is crucial.

According to Zaadoud, Chbab, and Chaouch's [4] definition, performance measurement frameworks are strategic expert frameworks, which allow enterprises to evaluate and track their intangible performance elements e.g., quantitate and

qualitative analysis. A performance measuring system is defined by Kadak and Laitinen [5] as "a concise and precise set of measures (financial or non-financial) that supports an organization's decision-making process via the collection, processing, and analysis of quantified data of performance information." Evidence from the academic literature suggests that before the 1980s, performance evaluation mostly focused on monetary metrics. Based on that, globalization provided a non-traditional approach, transforming the strategic emphasis from cheap manufacturing costs to high quality, adaptability, and timely delivery. This demonstrated the limitations of old conceptions and opened the door to new models.

The current suggested model suggests that businesses take use of non-traditional performance measurement tools to help them through the process. All workers are targeted, the system is straightforward and intuitive to use, data is reliable and up-to-date, and it promotes a culture of constant development, among other desirable qualities. With the goal of comparing a company's performance to industry standards, the European Network for Advanced Performance Studies (ENAPS) methodology provides a methodical framework for measuring a manufacturer's output. This methodical methodology has three primary components [6]. First, we establish a standard set of metrics for measuring worldwide performance. These include resources (money and time), output (quality and adaptability), and context (nature). Second, we create a standard set of manufacturing business procedures. Fulfilling orders, creating new products, gaining client dedication, and providing support after a transaction have all been identified as key customer service activities.

Lastly, all varieties of production are accounted for by using a manufacturing typology [7]. This category of factories includes those that produce goods for stock, assemble goods for customers, produce goods for customers, and even engineer goods for customers. A single KPI for a certain manufacturing process will only be instructive with regards to a small portion of the whole process. For instance, in make-to-stock production, the customer order fulfilment time parameter might be used as a key time-related performance indicator for the customer order fulfilment process. The European Network for Advanced Performance Studies (ENAPS) approach is used in this research to analyze performance measurement and benchmarking. Because it provides a framework for establishing comparable and comprehensive performance indicators, the ENAPS technique has been utilized as a foundation for comparing factories. The remaining part of the paper has been organized as follows: This paper firstly starts will identifying the performance measurement systems, which are classified as traditional and modern in Section II. Section III provides a brief description of the global performance indicators, while Section IV presents a generic business framework, and Section V focusses on elaborating the ENAPS networking system. Lastly, Section VI draws final remarks about the whole research.

II. PERFORMANCE MEASUREMENT SYSTEMS

Traditional PMSs

Cost and management accounting constitute the backbone of several time-honored approaches to performance evaluation. Technology advancements in this area occurred in the late 19th and early 20th century in response to the requirements of rapidly growing industrial sectors.

Table 1: Issues with the use of standard management accounting procedures for performance assessment

Issues	Description
Lack of relevance:	Management accounting reports have little bearing on manufacturing strategy, provide no useful information for monitoring production and distribution processes, and may even lead decision-makers astray when it comes to setting prices.
Cost distortion	Element costs are the primary focus of classical cost accounting. There has been a shift in the distribution of various cost categories, making this kind of dissection less crucial than it formerly was. The old techniques of allocating overheads may dramatically skew product costs since the line between indirect and direct expenses (and fixed and variable expenses) is not as clear as it once was.
Inflexibility	Traditionally, management accounting reports have been same across all facilities in an organization and have not evolved to reflect changing business requirements. Since operations managers often don't have access to cost accounting data until it's too late for them to be useful, they tend to regard these reports with contempt since they don't aid them in their work and may be used to pin the responsibility for unfavorable variances on the operations manager.
Obscures to in World Class Manufacturing development	The adoption of WCM may be hampered by the prevalence of outdated techniques for calculating the profitability of capital expenditures, which may lead managers to do inefficient actions for the sake of appearances. Financial accounting involves a lot of specific data, which may be expensive to gather, and a focus labor and machine efficacy rate stimulates the manufacturing of batch numerical.
Subjection to the requirements of financial accounting	Cost accounting are sometimes treated as an afterthought by those responsible for maintaining financial records. Management accounting solutions that add value do not rely on the same procedures and assumptions as finance and accounting systems. Accounting periods, inventory value, and the absorption of administrative costs are all applicable concerns that may be addressed using these techniques.

Formalization of the ideas occurred in the 1930s, and they have served as the foundation for factory performance monitoring systems ever since. In light of the dramatic developments in both technology and production methods in recent

years, it has become clear that the old methods of performance evaluation (based on management accounting) are no longer applicable. These antiquated procedures are useless at best and perhaps hazardous at worst. According to Reinstein and Bayou [8], the five most significant issues with the use of standard management accounting procedures for performance assessment are as discussed in (in **Table 1**):

According to authors in [9], the underlying assumptions of management accounting procedures are flawed because they are too narrow in scope. Incorrectness of these assumptions and their justifications are mentioned below.

a) "The overall system cost is equivalent to the sum of the individual operating costs." For the purposes of cost sharing, this presumption is incorrect.
b) All operations have a total cost that is directly related to the amount of labor put into them. Since certain processes are now automated, no human labor is required.
c) Without factoring in the price of materials, "the overall cost for the system is directly proportionate to the sum of the direct labor expenses." For many setups, labor expenditures account for a negligible fraction of the overall budget.
d) To predict how a change in the system's parameters would affect its overall price tag, you may use the inverse of the conventional cost process, which makes use of the determined overhead/labor ratio. The inverse must likewise be false if the computed overhead/labor ratio is incorrect.
e) In industrial processes, "optimizing local choices," where "local" refers to the level of decision-making closest to the point of production, "optimizes" the whole system. Some local choices may have an unintended consequence when optimized, affecting other sections of the organization.

"Achieving local optimums is essential to getting to the global optimal." It's possible that two or more local maxima are at odds with one another. These issues with management accounting methodologies have led many in the manufacturing industry to reject performance measuring systems that are based on management accounting.

Modern PMSs

There is a necessity for novel performance assessment frameworks in the manufacturing businesses for a number of reasons, not the least of which is the fact that the old methods have their share of flaws. Customer expectations for quality, performance, and adaptability are rising, and so are the management practices used in factories. Companies that want to compete in the global economy and take advantage of cutting-edge manufacturing processes require advanced tools for monitoring and managing their factories' efficiency. Measuring best-in-class production methods with outdated KPIs puts companies at a competitive disadvantage. Due to their origins in management accounting, the vast majority of conventional performance indicators focus on financial metrics.

In the modern industrial sector, however, monetary metrics are not the only factor considered by businesses when making important choices. Businesses now need performance metrics based along additional competitive dimensions like speed and quality to help inform their decisions. World-class manufacturers need cutting-edge performance measuring systems, and such systems should have the following features [10]: (i) They have important bearing on the approach used to production. (ii) They are not based on monetary values, and they vary depending on where you are. (iii) They are simple and straightforward to use, and they evolve over time to meet new requirements.

While the use of performance metrics is nothing new, the recent emphasis on them is. Although they have been available for a while, it is only lately that top-tier manufacturers have started to use them in favor of traditional cost-based performance metrics in order to better steer the manufacturing process. It is crucial that performance metrics be appropriate for the processes they are monitoring, since they have the potential to strongly influence behavior. The traditional methods of evaluation will have to be scrapped in favor of these more up-to-date alternatives. It will be counterproductive to adopt further measures on top of the ones already in place.

Either no one will use them because they are unfamiliar with the new metrics, or everyone will use both sets of metrics, and the business will not benefit from the increased consistency and clarity that the new metrics were designed to provide. A new method of measuring performance should be implemented simultaneously with a new method of production. If an organization wants to re-engineer its business processes, for instance, it will first need to establish a manufacturing strategy and put in place appropriate performance metrics to gauge the initiative's success. Business Process Re-engineering can't begin until a strategy is in place, and new performance metrics are in place. Below is a short summary of two popular contemporary performance evaluation frameworks: the TOPP and AMBITE systems.

The TOPP System

Long et al. [11] in Norway collaborated with the Norwegian Federation of Engineering Industries (TBL) and the the Norwegian Institute of Technology (NTH), and 56 member firms to create the TOPP system, an innovative performance monitoring tool. TOPP is a questionnaire designed to assess a company's manufacturing operations in their entirety. It has three sections. The first section is addressed by a single individual and is meant to provide an overarching understanding of the business. The second section is for learning about the company's inner workings, and it may include twenty different people answering the questions. In the final section, we'll examine twenty different functional areas of the business that could use some tweaking. These include improvement process, information technology, personnel management, financial management, assembly/manufacturing, production control and planning, product development, technological planning, and marketing design.

The TOPP system considers three aspects when analyzing performance. These include (i) efficiency, which is the ability to utilize an organization's resources economically and effectively, (ii) adaptability, which is the understanding of the need

to adapt to new circumstances, and (iii) effectiveness, which is the ability to meet the demands of customers. Each question has a qualitative set of responses (i.e., onto a 1-7 scale with 1 representing poor and 7 as excellent). Businesses are asked to provide responses for both their current situation and their anticipated future state. In addition, they are asked to indicate on a scale from one to three the degree to which each issue is critical to the company's ability to compete (where one letter stands for "little relevance," "medium importance," and "great importance," respectively).

The TOPP framework is massive and laborious to complete. There are more than sixty pages total, and each page has between fifteen and twenty questions. Furthermore, there are three choices for each question (relative importance, future status, and status today). Therefore, around 3,000 evaluations are needed to fill up a single questionnaire. Since the TOPP system is not exclusive to any one business, the TOPP questionnaire's performance metrics are not necessarily tied to how an organization operates or what its customers expect from it. There is also no indication of how the various metrics for performance stack up against one another. Because the TOPP questionnaire is qualitative and relies on respondents' opinions rather than objective criteria, it is subject to the possibility of eliciting inaccurate or misleading results. Because of its comprehensive nature, the TOPP questionnaire challenges businesses to consider aspects of production they may not have given much thought to previously. All of the enterprise's measurables, but notably the 'G' categories, will be targets for improvement (i.e., great importance). The TOPP questionnaire's strength lies in its emphasis on future and present state assessments of businesses. Businesses that anticipate doing better in a certain area in the future than they are doing now should recognize that they need to initiate an improvement initiative in that area. TOPP is useful for comparing businesses since they all utilize the same questionnaire.

The AMBITE System

The AMBITE (Advanced Manufacturing Business Implementation Tool for Europe) methodology is another example of a cutting-edge PMS. The purpose of this methodology is to provide a method for top-level management to evaluate the results of their company's strategic choices.

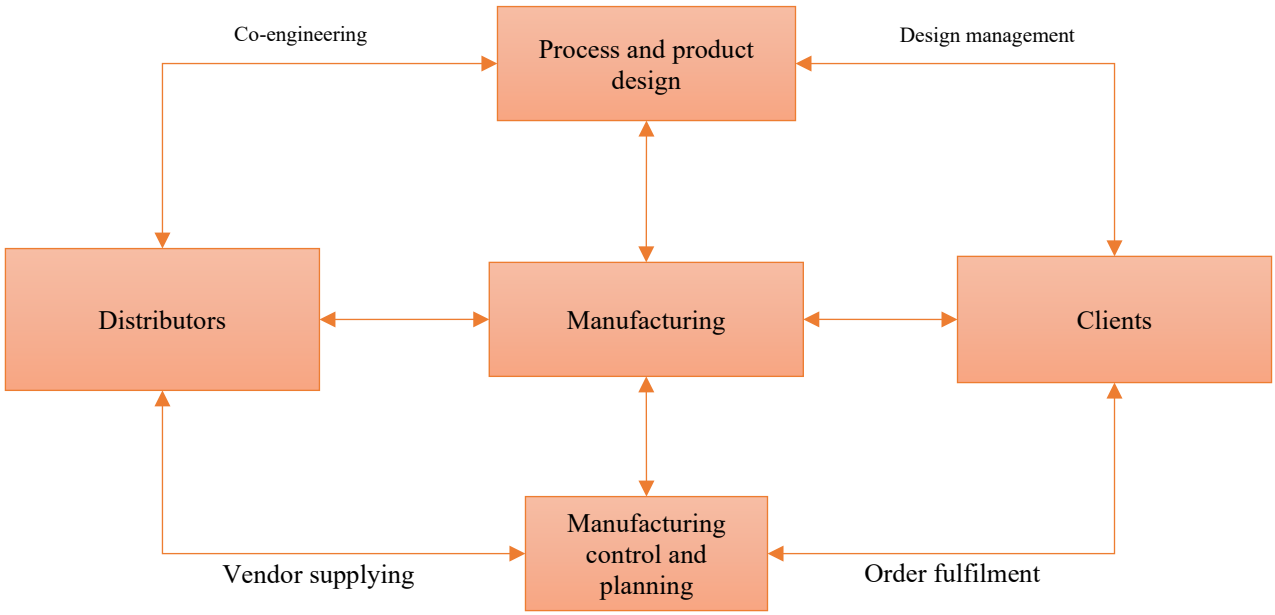

Fig 1. AMBITE framework for manufacturing firms

The framework offers a method for converting the company's business strategy (i.e., critical success factor) into a growth of indicators for performance measurement. The metrics used to evaluate efficiency will be process-oriented and closely tied to the company's overall goals and objectives. **Fig. 1** is a business model used by the AMBITE framework to characterize a production company. **Fig. 1** depicts the mapping between five broad business processes (production, co-engineering, design coordination, vendor supply, and order fulfillment) and corresponding broad performance indicators (environment, flexibility, quality, cost, and time). Manufacturing environments are categorized as: Make to Stock (MTS), Engineer to Order (ETO), Make to Order (MTO), and Assemble to Order (ATO), frameworks.

There is a total of 25- Strategic Performance Indicators (SPIs) [12] for every industrial sector in case the 5-macro business process is correctly mapped onto the 5-macro performance measure. The AMBITE method may be used to convert a company's CSF into AMBITE terms. By doing so, the company's strategic performance indicators may be calculated. It's possible to break these KPIs down into even finer-grained measurements. Since the composition of these metrics varies from company to company, it is necessary for each to develop its own unique set of KPIs. Once the CSFs have been determined (by the enterprise's business plan), it shouldn't be too difficult for the firm to build a performance indicator for itself, which is linked to the AMBITE model's complete collection of performance indicators. The AMBITE architecture dissects overall efficiency ratings into component measurements.

The hierarchical relationships between the KPIs are mapped out by this dissection. Because it is a process-oriented framework, organizations of all sizes may benefit from it. Every enterprise that adopts the framework will have its own customized set of key performance indicators. This makes it more difficult to fairly compare organizations, especially with regards to non-primary indicators of performance. Top-level performance indicators across industries may seem similar, but they are really built from a diverse range of key performance indicators. As a result, although it is good to conduct contrasts at the upper level (25 SPI), comparisons at lesser levels should be handled with caution.

III. IDENTIFYING GLOBAL PERFORMANCE INDICATORS

There can be no performance enhancement at the individual, group, or organizational levels without some mechanism for receiving feedback on that performance. Employees, teams, and businesses all benefit from receiving feedback when the results of their efforts are shared with them. When an employee is held accountable for their performance, they are more likely to work toward the organization's objectives. Measuring the performance of a company or a department is the bridge between strategic choices and tangible results. It has been claimed that in order to improve anything, you must first be able to measure it. This would imply that the quality you want to enhance is measurable. It has also been claimed that the very act of monitoring performance might lead to an increase in output. Whether or whether this is true, collecting data is essential for making progress. Measuring is a quantifiable procedure, but it ultimately serves to motivate constructive behavior change. Managers should keep in mind that almost every control has unintended implications if used improperly or in an inappropriate context. Before using performance metrics, managers should investigate the context and weigh the pros and downsides. Several facets of an organization's performance need to be tracked. Businesses used to place a premium on low costs as a primary metric. It is becoming clear that other aspects of performance are vital to an organization's success, even if cost remains a major factor. Time has been a major factor for many businesses as of late. Timeliness is becoming more important in many contexts, including delivery, product development, and the handling of client complaints. Time is a crucial metric since customers increasingly anticipate rapid turnaround.

For businesses, quality has emerged as a major source of competitive advantage. Quality in a broader sense, not only product quality, should be included in any measurement of "quality" if we want to boost customers' happiness. Businesses are becoming more cognizant of the need of incorporating a degree of flexibility into their operations in response to consumers' growing appetite for variety and the resulting unpredictability. It is essential to gauge performance in terms of adaptability since the processes need to be robust enough to deal with variation and unpredictability. At long last, citizens and government officials alike are starting to realize how important it is to preserve our planet. Measuring performance in terms of sustainability is becoming more vital. Cost, time, quality, adaptability, and ecology are the five key metrics. The ENAPS project employed these GPIs to rank the quality of several performance metric for the usage in assessment.

IV. A GENERIC BUSINESS FRAMEWORK

The processes to be monitored may then be decided after the metrics have been created. The enhanced version of the ENAPS business framework is indicated in **Fig. 2**. This framework is developed based on the ideology of expanded business.

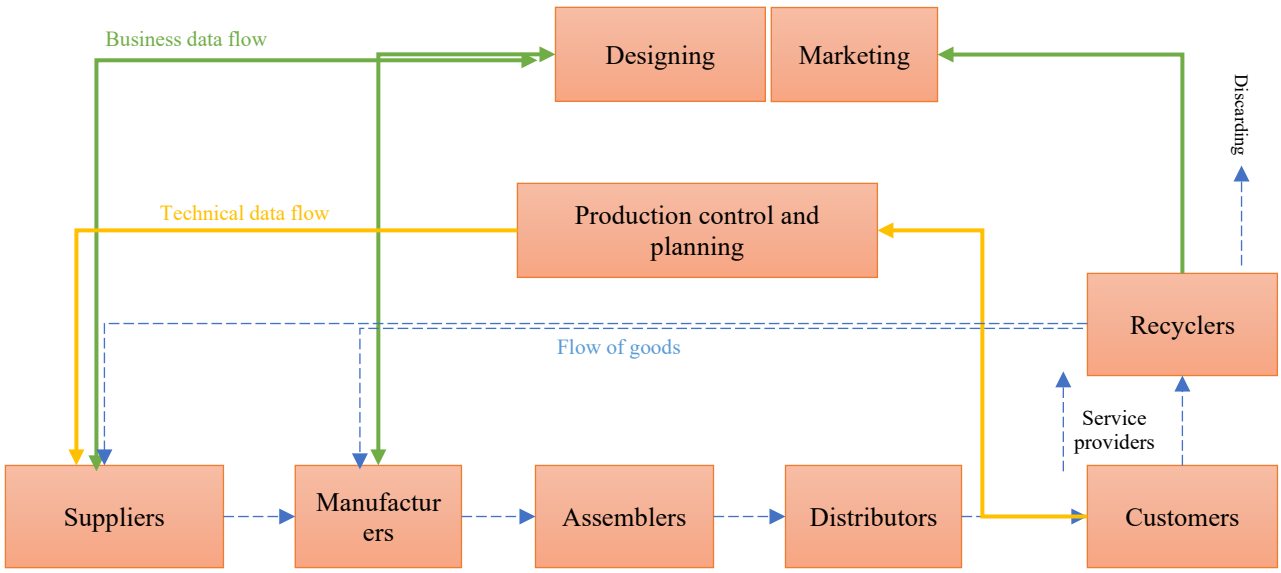

Fig 2. ENAPS business framework

The service providers, recyclers, suppliers and clients are only a few of the external partners defined as part of an extended enterprise's functional remit under this model. The notion differentiates three types of flow: business data flow, material flow, technical data flow. Materials go from the producer to the retailer to the end-user to the recycler and service provider through the supply chain. Customer demands in a firm flow down to the marketing and design departments [13]. Design criteria are communicated for co-engineering purposes between the corporate design team, manufacturing, and suppliers.

Client orders are the primary source of information in most businesses, and they are handled by production planning and control before being sent to the appropriate departments for processing.

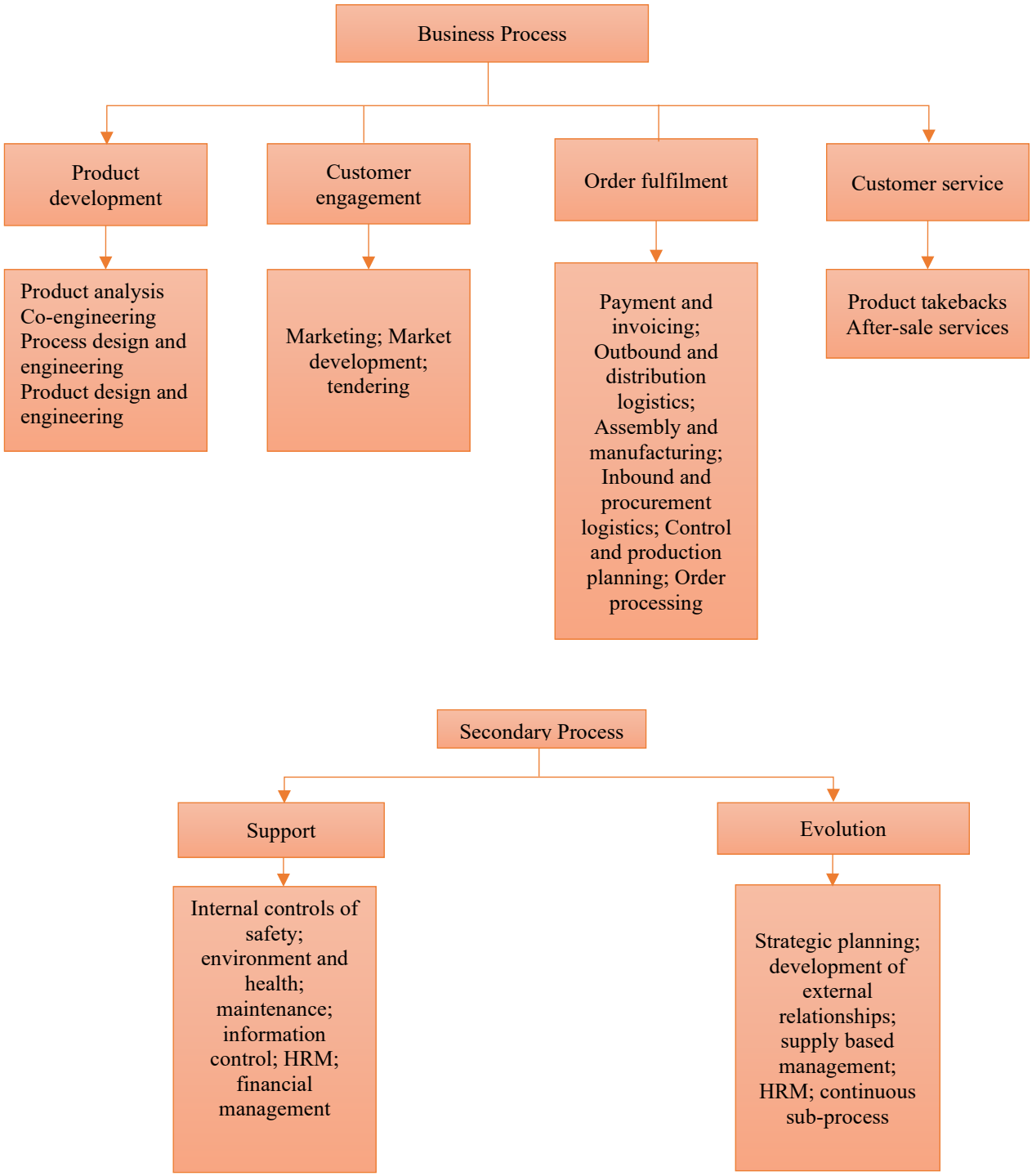

Fig 3. Business and secondary processess of the framework

Manufacturing Typologies

According to the kind of manufacturing company, different standards for performance indicators will be used [14]. This provides a new metric to consider when evaluating efficiency: sector. ENAPS uses the customer order decoupling point production style of manufacturing. This classifies manufacturers into four subsets according to the degree to which their output is dependent on specific customer orders. There are four types of production methods: those that create goods for stock, those that assemble them on demand, those that create goods on demand, and those that are engineered to order. Products that are "make to stock" are mass-produced and kept in a storage facility. The supply is immediately used to satisfy customer demands. Assemble-to-order factories have a stock of semi-finished materials so that products may be crafted to

order once an order is placed. Make-to-order factories typically wait for an order from a customer before beginning production on any given product or component. When a customer places an order, the engineer to order manufacturer then gets to work designing a product that will be made to order for that specific consumer. Each business process and subprocess in **Fig. 3** has its own set of performance indicators for a five dimensionality of flexibility, quality, environment, cost and time, include four forms of manufacturing. There's at least one performance indicator on every facet of the cube. To sum up, this provides a somewhat well-structured set of manufacturing business performance measurements.

Benchmarking

In business, comparing your company's products, services, operations, and other business processes to those of your competitors and industry leaders is known as performance benchmarking. It's a great resource for pinpointing areas of improvement for any business. Some variables that might be assessed and compared include time to market, cost per unit, net promoter score, and customer retention. Whether or not the target market or sector is the same, performance benchmarking may provide valuable insights into how other brands perform in relation to one. Most businesses use some type of Corporate Performance Management (CPM) software to monitor their efficiency. It aids monitoring key performance indicators and changing operations appropriately to ensure targets are fulfilled. A great way to learn from the successes and failures of competitors is via benchmarking.

McKinnon, Walker, and Davis provide a concise summary of the most common approaches to developing standards. They split benchmarking methods into two groups: criterion references and quantitative measures. The criterion reference technique establishes a benchmark for excellence in a certain subject by outlining what constitutes best practice. Comparing performance to quantitative standards, on the other hand, allows for assessments of institutional shifts in norm vs innovation. Nehme, Michael, and Kozah [15] argue that universities should focus less on internal and more on external benchmarking because of the challenges they provide to the learning process; about where improvement might occur and to the commitment to implementation over the long term. These include:

a) A concentration of the results rather than processes;
b) A concentration of the best vs good practices, whereby good practice is considered and best practices are defined by a high level of practice considered in the benchmark;
c) A test of progressive improvement;
d) An identification of a benchmark in order to measure the effectiveness of a functionality in stead of countable.
e) An adjustment of the inequality in the university characteristics so that the benchmark could be considered as ratios, times, and proportions.

The ENAPS system is built on a performance-based system of benchmarking. Performance benchmarking, in contrast to process benchmarking and strategy benchmarking, compares objective performance metrics. Typically, this is done so that one may gauge where they are in relation to competitors, pinpoint problem areas or procedures, and establish attainable goals based on the successes of similar businesses. A benchmarking wheel serves as the basis for the benchmarking process. The usual benchmarking research consists of five stages, each of which focuses primarily on the detailed included in **Fig. 4**.

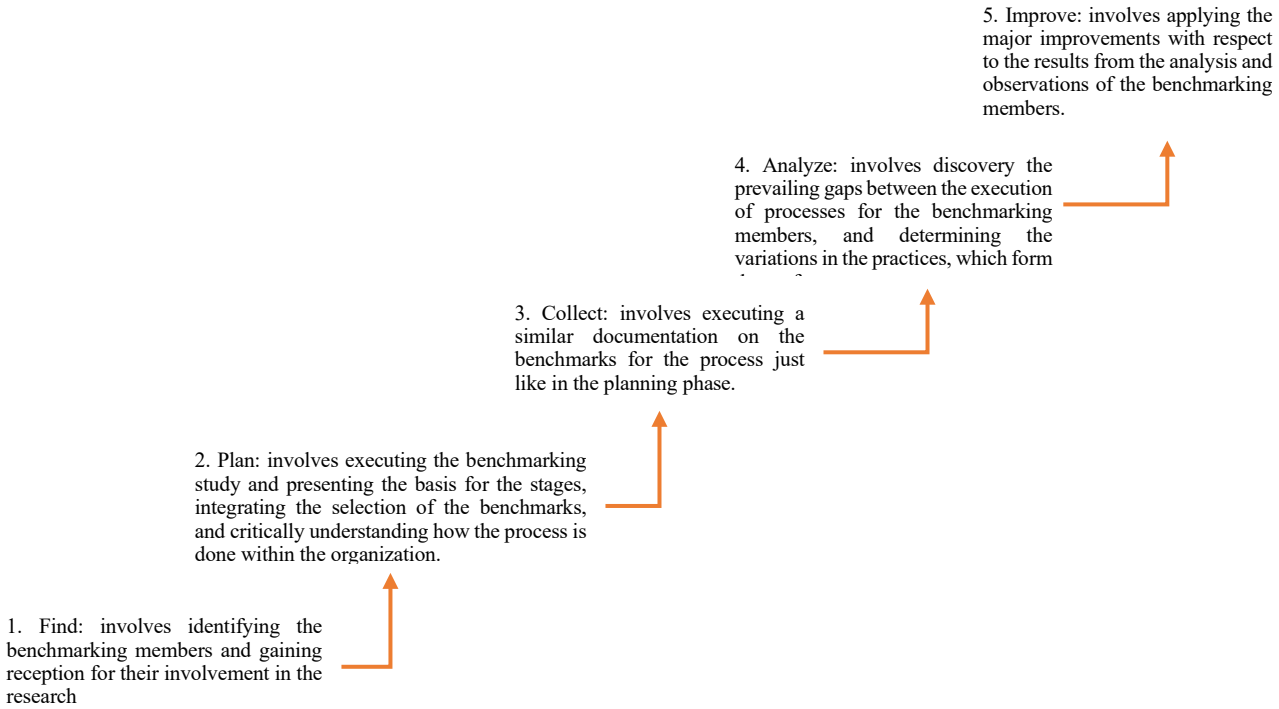

Fig 4. Stages involved in the benchmarking research

These five stages each provide unique difficulties for the benchmarking organization, but they are essential building blocks of a successful benchmarking research that will lead to the desired outcomes.

V. THE ENAPS NETWORKING SYSTEM

The ENAPS planning establish a network throughout Europe. The outcome is a functional network with the skills and competence detailed in what follows. The network's nodes will be located worldwide. (Agents are what we call these nodes.) Members of the following groups of partners will contribute to ENAPS (see **Table 2**):

Table 2. Members contributing to ENAPS

Groups of partners	Description
Steering Committee	This is the highest authority in charge of productivity and efficiency. It will establish guidelines and directives, choose methods and determine which research will be conducted. The purpose of the steering committee is to play an instrumental role. Significant high-level industrial experience is required. The five business or industry federation partners will form the steering committee. Two or three annual gatherings are planned.
Co-ordinating body	Essentially, this group is what will keep the network running and updated on a regular basis. Five nations from various parts of Europe will form this squad. There will be two partners from each of these nations: one academic and one commercial. These parties will create the instruments required for the job, as well as coordinate with other entities, such as agents and specialists, to carry it out.
Agents	Agents serve as local points of contact or advisors for businesses and institutions throughout the globe. The agents will work inside their own countries and serve as the connecting point between businesses and other groups of end-users. The agents will act as intermediaries between the operating body and users of the findings on a regional or national scale. As the project's regional component, they play a significant part.
Experts:	The experts in a certain field are recognized authorities on a national or worldwide scale. These professionals are contacted when needed. Consultants, businesses, and universities are all possible sources for experts. In every instance, they will be awarded contracts to do specific research. Experts will not come from a predetermined pool, but there will be a screening process for individuals interested in applying.
User groups	Those who will ultimately benefit from the findings are the user groups. These communities might be organized on a regional or a sectoral scale. Businesses, consultancies, government entities, and others may all be included.
Industry:	The major beneficiary of the outcomes is industry.
Government and public:	The research will provide generalized findings for the government and the general public.
Industrial nodes:	Industry nodes might be chambers of commerce.

In order to conduct micro-level analyses of performance, the European industry will have a vehicle in this network. The optimal methods for conducting business processes inside the participating companies will be the subject of such research. Through the network's infrastructure, member businesses and interested SMEs will be able to share and learn from each other's best practices and data through electronic methods. The European Union's work to build the information superhighway, together with advances in multimedia technology, will make such dialogue possible. The network's goal is to improve European industry as a whole by tapping into the knowledge and resources of a subset of European businesses and academic institutions. Studying and teaching how to increase business performance, as well as doing industrial initiatives, are all geared toward making companies stronger and more competitive. Large corporations will be part of the network, but the group's primary objective should be the transfer of technology to Smaller and Medium-sized Enterprises (SMEs). The network's primary goal is to assist European corporate, government, and academic leaders in better understanding and preparing for the next era of business processes engineering by:

a) Facilitating communication and cooperation across European borders for the purpose of improving our collective knowledge of performance.
b) Examining the reasons of high-performing techniques like supplier/customer contracts, concurrent engineering, self-managed groups, SCM, and so on.
c) Regional initiatives should be encouraged so that governments may get started on building the infrastructure necessary to draw in commercial networks. In this context, the most pressing problem is the engineering or reengineering of business processes, thus it's important to teach key participants that productivity is the ratio of value delivered to the firm to the cost of the resources used.
d) Improving blue collar workers' human capital via education.
e) Shaping university and professional training programs to better equip students and workers for today's collaborative, cross-cultural, process- and team-oriented workplaces that value cooperation among businesses over the traditional, adversarial, win-lose paradigm.

ENAPS connects agents and academic partners all around Europe. Each agent uses the ENAPS technique to gather data on the performance of manufacturing businesses on which they work directly. Agents may gather information more efficiently with the use of an electronic questionnaire. The collected information is subsequently placed in a centralized

database, which is presently managed by an academic partner in Germany. Depending on the need for privacy and confidentiality of the various businesses, the information may be made public or anonymous. When an enterprise's agent enters data into the database on the company's behalf, administrators may run queries to compare the business to its peers. Given the database's infancy, there are now only around 50 corporate data sets available. Thus, only limited benchmarking may be accomplished. The benchmarking service offered by the ENAPS network improves as more businesses are added to the database.

Fig. 5 is a schematic depiction of the ENAPS network's organizational framework. Five universities and five corporations are working together to manage and coordinate the project's agents. Every representative has a partner with whom they work closely. In tum, every representative works with a certain manufacturer. To better use the benchmarking data to execute improvement strategies throughout the organization, ENAPS seeks to strengthen the agent's connection with the company. Agents will oversee these development strategies, and the ENAPS database may be queried at regular intervals to measure progress versus industry standards.

Fig 5. Data exchange within the ENAPS network

As seen in **Fig. 5**, data is shared throughout nodes. Agents gather information, which is then recorded in the database as general indicators of ENAPS performance. Agents may conduct inquiries on a company's behalf to compile benchmarking data. With these findings, a company may evaluate how well its operations are running.

VI. CONCLUSIONS

Measuring and comparing results against peers is key to ENAPS' strategy used in this paper. According to this research, measuring performance helps a business keep tabs on its most important metrics, which allows it to see changes over time and identify where it's excelling or falling short. To effectively benchmark, businesses must first identify and prioritize their most essential goals (also known as crucial success criteria) before evaluating their progress against industry standards. Common practice dictates that we examine the discrepancy between current performance and ideal outcomes in order to pinpoint places where we might make gains. Using benchmarks, a company may see how its processes stack up against those of comparable businesses. The ENAPS methodology is useful for comparing factories because it offers a framework for developing comparable and comprehensive performance indicators. The ENAPS method works well for small and medium-sized businesses. Large corporations often have the resources to conduct internal benchmarking or to hire an expensive international advisory company for the same purpose. Small and Medium-sized Enterprises (SMEs) seldom have access to such choices. The solution that ENAPS offers is affordable and tailored to the needs of smaller businesses.

Data Availability

No data were used to support this study.

Conflicts of Interest

The author(s) declare(s) that they have no conflicts of interest

References

[1]. M. Alrashed, T. Nikolaidis, P. Pilidis, S. Jafari, and W. Alrashed, “Key performance indicators for turboelectric distributed propulsion,” Int. j. product. perform. manag., vol. 71, no. 5, pp. 1989–2008, 2022.
[2]. W. Mu, C. E. van Middelaar, J. M. Bloemhof, B. Engel, and I. J. M. de Boer, “Benchmarking the environmental performance of specialized milk production systems: selection of a set of indicators,” Ecol. Indic., vol. 72, pp. 91–98, 2017.
[3]. Y. Yuliansyah and J. Jermias, “Strategic performance measurement system, organizational learning and service strategic alignment: Impact on performance,” Int. J. Ethics Syst., vol. 34, no. 4, pp. 564–592, 2018.
[4]. B. Zaadoud, Y. Chbab, and A. Chaouch, “The performance measurement frameworks in healthcare: Scopus study,” J. Health Manag., vol. 23, no. 2, pp. 275–293, 2021.
[5]. T. Kadak and E. K. Laitinen, “How different types of performance management systems affect organizational performance?,” Meas. Bus. Excel., vol. 25, no. 3, pp. 315–327, 2021.
[6]. M. Yüzükrmz and M. Pinarbai, “A new framework for balancing and performance evaluation in stochastic assembly line using queueing networks,” Eur. J Ind. Eng., vol. 17, no. 1, p. 1, 2023.
[7]. S. Ganguly, S. Das, and S. Pandya, “Influence of strategy typology on innovation: Evidence from the manufacturing sector,” Int. J. Electron. Gov. Res., vol. 18, no. 2, pp. 1–16, 2022.
[8]. A. Reinstein and M. E. Bayou, “FASB (Financial Accounting Standards Board) issues new accounting rules for debt and equity securities,” Healthc. Financ. Manage., vol. 48, no. 10, pp. 34–41, 1994.

[9]. A. Yasinska and Lviv Polytechnic National University, "Accounting procedures digital transformation for business processes improvement," Econ. Entrep.. Manag., vol. 8, no. 2, pp. 44–50, 2021.
[10]. X. Wang, H. Hu, and Y. Wei, "Multi-period two-stage DEA model: measuring performance of integrated production and service systems in Chinese cable TV industry," INFOR Inf. Syst. Oper. Res., vol. 60, no. 3, pp. 385–406, 2022.
[11]. M. Long, P. Paniagua, G. Grimstad, A. Trafford, S. Degago, and J.-S. L'Heureux, "Engineering properties of Norwegian peat for calculation of settlements," Eng. Geol., vol. 308, no. 106799, p. 106799, 2022.
[12]. T. R. Merlo, "Strategic implications of key performance indicators for knowledge management success in organizations: The balanced scorecard framework," in Understanding, Implementing, and Evaluating Knowledge Management in Business Settings, IGI Global, 2022, pp. 210–235.
[13]. J. J. Hoppner, P. Mills, and D. A. Griffith, "Navigating the demands of increasing customer participation through firm and individual job resources," Ind. Mark. Manag., vol. 97, pp. 173–182, 2021.
[14]. E. Domínguez, B. Pérez, Á. L. Rubio, and M. A. Zapata, "A taxonomy for key performance indicators management," Comput. Stand. Interfaces, vol. 64, pp. 24–40, 2019.
[15]. R. Nehme, A. Michael, and A. E. Kozah, "Performance appraisal and premature sign-offs and underreporting of chargeable time of external auditors – internal benchmarking of experience and gender," Benchmarking, vol. ahead-of-print, no. ahead-of-print, 2020.