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A PROBLEM-ORIENTED APPROACH FOR DEPLOYING PRODUCTIVITY MANAGEMENT CYCLE (CASE STUDY: TELECOMMUNICATION INFRASTRUCTURE COMPANY)

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ABSTRACT

Nowadays, economic growth is one of the main national goals, which can be achieved in two ways: building new capacities or using the existing capacities, optimally. Concerning Iran's limitations in implementing the first approach, national productivity improvement is the only possible solution. For this purpose, the role of the public and private sectors, as important participants in the national economy, is undeniable. This fact has made the deployment of productivity management cycle in organizations, a national concern. In this paper, a problem-oriented approach for the productivity management cycle deployment is presented which aims to help organizations in productivity management. The proposed approach consists of two main phases: analysis of the current situation and productivity improvement planning. In the first phase, the performance of the organization is evaluated based on intra and extra-organizational goals and expectations. In the second phase, based on the analysis, the productivity problems are defined and consequently, the action plans are designed. To ensure the applicability of the proposed approach, the Telecommunication Infrastructure Company is considered a real case. Finally, the findings and experiences, resulting from deploying the proposed approach, in this case, are presented.

***KEYWORDS*:** Productivity Management Cycle, Problem-oriented Planning, National Economic Growth, Public Sector, ICT Industry.

1. INTRODUCTION

Nowadays, sustainable development and economic growth are considered the main issues and national goals in countries. Generally, economic growth is achieved in two ways: (1) creating new capacities for resources, including labor and capital, and (2) improving productivity and using existing capacities and resources, optimally. The first approach aims to increase the production capacities and the second approach attempts to manage existing resources and capacities, efficiently and effectively (APO, 2021). Capacity building requires strong interactions between countries to make the import of up-to-date knowledge, technology, etc. possible. In many countries, there are constraints to capacity building. For example, in Iran, with regard to political sanctions and consequently, undesirable market conditions and environment, the economic growth through the

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quantitative improvement of new resources, is complicated. Numerous types of research referred to the sanction effects on Iran's economic growth. Madani (2021) comprehensively studied the impact of international sanctions on Iran (Madani, 2021). According to various barriers that exist to economic growth using capacity building, increasing national productivity is the only possible way to achieve sustainable development and economic growth goals (Hajihassaniasl, 2019).

According to the report, published by Work Bank Group, the productivity issue is a global concern and its reduction can significantly influence many national aspects (Dieppe, 2021). National productivity improvement requires efficient capacity utilization and effective value creation in operational firms and national enterprises. From a systematic viewpoint, the national productivity improvement depends strongly on the performance of economic firms. As a result, the role of public and private sector firms cannot be ignored in improving national productivity and economic growth (Linna et al., 2010). A recent study, by Hubspot, revealed that low productivity costs employers around USD 1.8 billion, annually. These costs lead to poor organizational performance and many major consequences (Cox, 2021). Poor organizations, as one of the main economic players of a country, will stunt the Gross Domestic Product (GDP) or the economic output and result in many national failures such as economic reduction, poverty, migration, etc.

Accordingly, productivity is almost everything, in the long run, and countries' ability to improve their living standards depends on productivity (Ross, 2019). The necessity of attending to productivity issues has made many countries emphasize productivity improvement in their general national policies. For example, in Iran, Section A of Article 5 of Iran's Sixth Five-Year Development Plan, makes all the firms deploy a productivity management cycle at the organizational level and focus on economic growth through productivity improvement. Moreover, based on the third Article of the Sixth Five-Year Development Plan, 33 percent of economic growth should be achieved through improving Total Factor Productivity (The Law of Sixth Five-year Development Plan).

The main question is how can the productivity management cycle be effectively deployed in organizations to fulfill legal duties and improve organizational productivity and national economic growth. Regardless of the theoretical concepts, how can productivity be measured and analyzed practically? How can the required action plans be designed and implemented to improve and enhance productivity?

Succeeding in improvement requires principled planning for progress (Jeseviciute-Ufartiene, 2014). Planning can be done in two ways: top-down planning and bottom-up planning methods. In top-down planning, the main goals are defined, first, based on the desires and requirements, and then the ways to achieve them are determined. In contrast, bottom-up planning is a problem-oriented method that begins with issues that exist on the front lines. Unlike top-down methods, which are suitable more for strategic planning, the bottom-up methods are more compatible with operational concerns (Pissourios Ioannis, 2014). Today's emerging management paradigms focus on using problem-based planning approaches. Many newly introduced concepts in this era use a similar approach. For example, in the TRIZ (Theory of Inventive Problem Solving) methodology, introduced by Genrich S. Altshuller, problem identification and solving related contradictions are considered as first steps for creatively planning (Starovoytova Madara, 2015; Petrov, 2019). The first step of the problem-oriented planning approach is problem identification, in which the barriers between desired goals and the current situation are considered as the problem (according to the TRIZ technique), and then, solutions to deal with these barriers are searched for and evaluated (Kim, 2009).

The main purpose of this study is to provide a problem-oriented approach to deploying the productivity management cycle in organizations which enables them to:

1) Understand requirements and goals concerning productivity improvement,
2) Assess and analyze the current performance level from a productivity viewpoint,
3) Define the productivity problems according to the gap that exists between current and desired situations,
4) Discover the root causes and fundamental essences of the defined problems,
5) Develop action plans to overcome the root causes and solve productivity problems and consequently, improve organizational productivity.

The proposed approach can be used as a tool for managers to:

- Improve productivity level practically,
- Deploy the organizational productivity management cycle rationally,
- Play their managerial role in the country's economic growth.

2. RESEARCH BACKGROUND

In this section, the theoretical foundations of productivity are studied first, and then, previous research in this field is reviewed.

2.1. Productivity Concept

Throughout history, humans have always tried to use the available resources optimally, given the conditions and limitations ahead, and be purposeful in doing their work. Therefore, continuous efforts to improve the way things are done and the correct use of resources to achieve the expected outputs have always been one of human interests. Today, this concept, which emphasizes using the inputs correctly and trying to achieve maximum targeted outputs, is known as productivity (Tangen, 2005).

From the scientific viewpoint, the term productivity was used for the first time by a researcher named Quesnay in 1776, who introduced productivity as a key component of a government authority. In 1883, Liter introduced productivity as a capability and talent in producing (Shekari and Rahimi, 2012). According to the Asian Productivity Organization's (APO) definition, productivity means optimum use of existing facilities, capital, and capacities which leads to reducing manufacturing costs, expanding markets, increasing the employment rate, and raising living standards (Oraei, 2014).

According to different definitions, to be productive, two issues should be considered: (1) Doing things right and (2) Doing the right things. The first concept is about how works are done and emphasizes the way by which inputs, such as resources and facilities are used to do things. The second concept emphasized achieving the goals and accordingly, considers doing works by which the expected goals can be achieved. In the literature, "doing the thing, right" equals the word "efficiency" and "doing the right thing" equals the word "effectiveness". Accordingly, many researchers define productivity as a combination of efficiency and effectiveness (NPO, 2021).

The fact that improvement is a never-ending process makes improving productivity an unstoppable effort and gradually led to the creation of a new concept in the literature, called the productivity management cycle. This concept which was first introduced by Sumanth consists of four main steps as shown in Figure 1 (Sumanth, 1988).

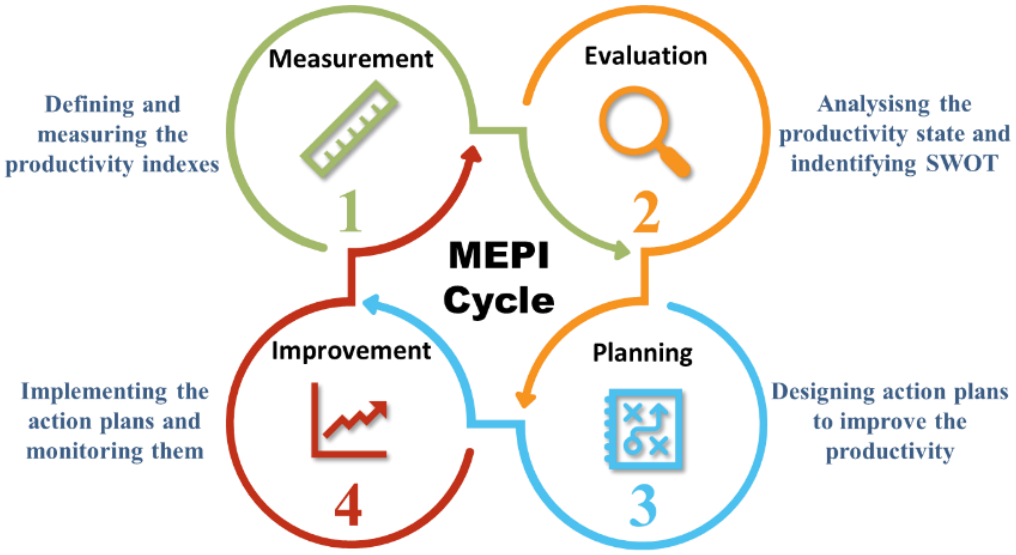

Figure 1. Productivity management cycle

2.2. Literature review

During the last two decades, productivity management has been widely considered by researchers and managers. Some researchers have focused on the necessity of measuring productivity and presented considerations and methods for measuring productivity (OECD, 2001; NasrolahNia et al., 2014; Yilma Goshua et al., 2017; Rahmati and Pilehvari, 2018;). A significant number of researchers have examined the factors affecting productivity (Lajevardi et al., 2015; Sabouri and Rasouli, 2016; Chukwulozie, 2018; Taifa and Vhora, 2019; Zeraatkar et al., 2020). In recent years, some researchers have exclusively focused on the components of productivity, such as human resources and capital, and consequently, studied single-factor productivity and multi-factor productivity (Pekuri et a., 2011; Phusavat, 2013; Alimohammadpour et al., 2020; German Council of Economic Experts, 2020; Diwas, 2020; Seifolahi, 2021). Also, few studies have addressed the issue of deploying the productivity management cycle in organizations and described its main steps (Ahadi Nia, 2005; Caliendo et al., 2020).

Despite numerous types of research on the subject of productivity, most of them have addressed theoretical issues. But in the current situation that the national economic growth depends on improving productivity, today's concerns are far from the theoretical aspect and closer to practical issues. Syverson (2011) comprehensively surveys work addressing the question of why businesses differ in their productivity levels and concluded that research about productivity should go forward because lack of practical suggestions to deploy productivity management cycle in organizations (Syverson, 2011)

Therefore, the lack of a systematic mechanism on how to deploy the improvement management cycle efficiently and effectively which leads to improving organizational productivity and national economic growth is obvious. Accordingly, this study attempts to fill this gap by presenting a systematic approach that aims to deploy the productivity management cycle at the organizational level. This approach helps managers to:

- fulfill their upstream responsibilities,
- play their roles in improving productivity,
- make continuous organizational performance improvement possible in practice.

3. METHODOLOGY

This paper aims to develop a practical and problem-oriented approach by which the productivity management cycle can be deployed in organizations. Based on the general steps of the productivity management cycle, the current approach contains two main phases, as shown in Figure 2.

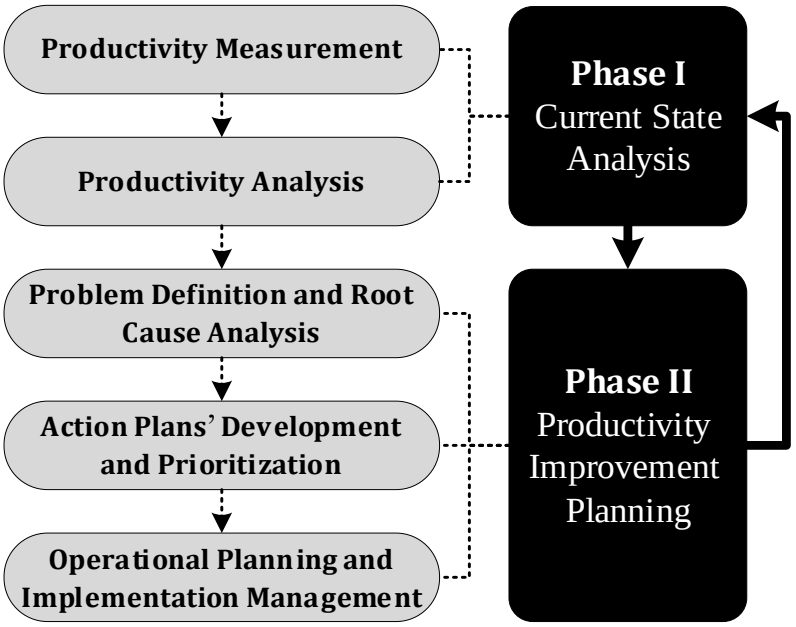

Figure 2. Productivity management cycle deployment process

3.1. Phase I: Current State Analysis

Developing improvement plans requires analyzing and understanding the current situation. To be aware of the current organizational state from the productivity viewpoint, two main issues should be considered:

- Defining and measuring productivity indexes
- Analyzing the organizational performance based on the areas that affect organizational productivity

3.1.1. Defining and Measuring Productivity Indexes

During the first step, to be aware of the current performance state, organizational productivity should be measured using several metrics. With regard to efficiency and effectiveness concepts, it is necessary that productivity metrics also cover the following categories:

- Efficiency metrics: these indicators measure the ratio of outputs to inputs and evaluate the organizational success in profitability using factors of production. Some of the main efficiency metrics are manpower productivity, capital productivity, and total factor productivity. Also, complementary metrics can be defined based on the organization's needs.
- Effectiveness metrics: these metrics examine the organization's success in achieving goals with respect to the organization's mission. Defining this type of metric strongly depends on the organizational missions and outcomes it seeks.

To analyze the productivity indexes, the behavior and trend of the metrics should be considered over time, because productivity is a relative concept and the best basis for evaluating and comparing an organization's performance is its previous states.

3.1.2. Productivity Analysis

The main purpose of this step is to examine the current state of productivity in the organization and consequently, prepare the organization for future productivity planning. In problem-oriented planning, first, the favorable expectations and main goals should be identified based on regard to productivity viewpoint. Then, by these desirable goals, organizational performance should be analyzed. The main considerations of this step are:

- Identifying the organizational and upstream goals and productivity-related expectations

Awareness of future goals and objectives gives direction to the improvement plans. To identify the organization's expectations and goals, two items including (1) the strategic plan of the organization and (2) upstream documents, are examined. Examining the organization's strategic plan provides appropriate information about the main orientations of the organization, strategies, and organizational goals. Moreover,

studying the upstream documents identifies the requirements and expectations of external stakeholders and thus determines the operational areas, that should be considered to meet these expectations. Because of the qualitative nature of the organization's strategic plan and upstream documents analysis, the thematic analysis technique is proposed to analyze these documents and identify the main themes of organizational orientations and expectations (Boyatzis, 1998). This step results in the main context of organizational goals and specifies the areas that are in line with achieving these goals.

- Evaluating the current organizational performance based on the preidentified goals

The organizational performance concerning the productivity issue is evaluated based on the following considerations:

  - Reviewing existing documents and performance records
  - Interviewing and consulting the experts

This step leads to determining the gap between the current and desired situation and identifying SWOT (strengths, weaknesses, opportunities, and threats) for improving the performance. This is necessary to determine the productivity problems and issues in the next phase. Figure 3 indicates the main function of the first phase in the proposed approach.

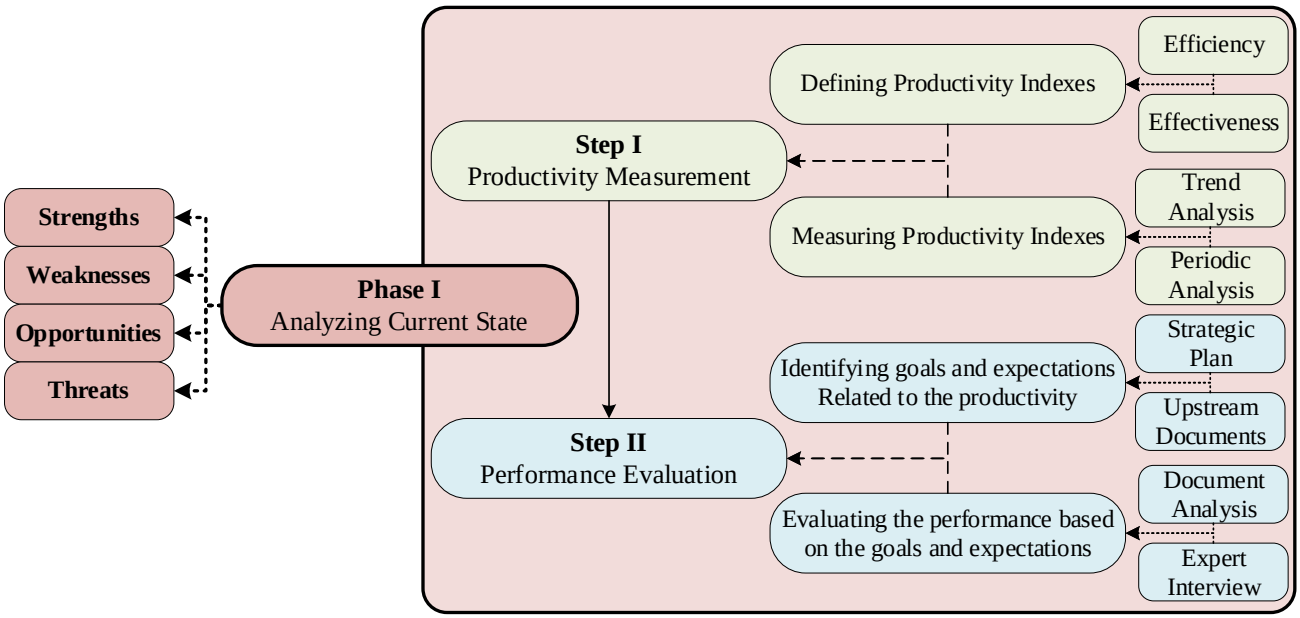

Figure 3. The current state analysis process

3.2. Phase II: Productivity Improvement Planning

To effective and implementable improvement plan, it is necessary to determine a path, taking into account the gap between the goals and the current performance situation. In this study, to rationalize the procedure of designing plans and prevent unrealistic planning, the problem-oriented approach, as shown in Figure 4, is used for productivity improvement planning.

Figure 4. Problem-oriented approach's logic

3.2.1. Problem Definition and Root Cause Analysis

Following the analyzes performed in the previous phase and identifying the main gap between the current performance state and the desired goals, productivity problems are defined. Productivity problems are defined as organizational failures in meeting the desired expectations and goals. The main subjects of productivity problems can include issues such as low productivity of production factors including manpower and capital, low added-value, high cost for services and products, and high operating costs.

After defining the productivity problems, the main causes and roots of the problems should be discovered before solving them. There are numerous techniques to root cause analysis. In this study, the Root Conflict Analysis (RCA+) technique is used to analyze the main productivity problems. This technique was first introduced by Valeri Souchkov in 2005 as a new way to strengthen the problem analysis phase in the Theory of Inventive Problem Solving (Souchkov, 2005). Figure 5 shows the rooting algorithm in the RCA+ technique (Souchkov, 2007).

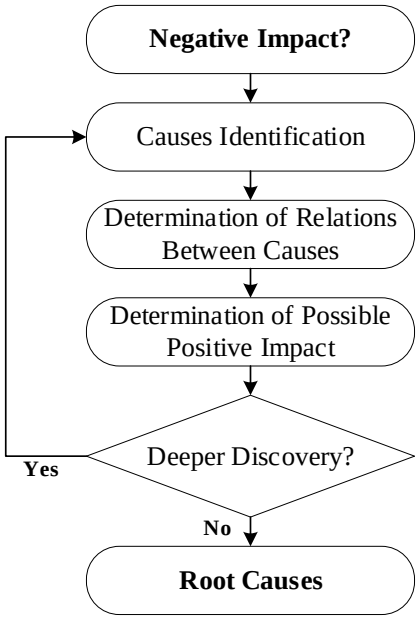

Figure 5. RCA+ algorithm

3.2.2. Action Plans Development and Prioritization

In this step, by the root conflict analysis, action plans to deal with the root causes and solve productivity problems are developed. For this purpose, the experts and specialists are asked to suggest solutions to overcome the root causes and productivity problems. Accordingly, this step yields several action plans that can be used to improve organizational productivity.

Organizational constraints such as budget limitations make attending to all the action plans, simultaneously, impossible. Hence, the managers have to first prioritize the action plans and then choose the best action plans for implementation. There are different methods to prioritize options and the Analytic Hierarchy Process (AHP) is one of these methods. The AHP method was first introduced by Saati in 1979 and is one of the most common multi-criteria decision-making methods (Saaty and Peniwati, 2008). According to the steps of the AHP method, Figure 6 shows the process of action plan prioritization in the proposed approach. The first step includes a definition of options and criteria by which the options are compared. Obviously, in this article, options include action plans, determined to face root causes. The DM criteria could be different metrics and options are compared and scored according to them. In the second step, the priority and weight of criteria are defined based on their importance in the decision-making problem. For this purpose, the experts will be asked to weigh the relative importance of criterion 1 vs. criterion 2 and so on. Accordingly, the weight of each criterion is calculated. Then, scoring the options is implemented through pairwise comparison of options for each criterion, separately. For example, the experts will be asked to weigh the relative importance of criterion 1 from option 1 to option 2 and so on. Accordingly, the total score for each option is calculated about all criteria and their weights. Finally, the option with the highest score is ranked 1st, and so on.

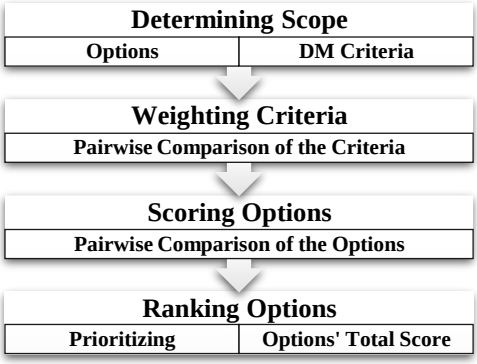

Figure 6. The process of prioritizing action plans based on the AHP method

3.2.3. Operational Planning and Implementation Management

After determining the action plans and selecting the most effective one, it is essential to define an operational program for high-rank action plans, selected in the previous step. This program should at least include the following information:

- Expected goals
- The implementation process of the program
- Scheduling of the activities
- Responsible and accountable for the program
- Indicators for measuring the efficiency and effectiveness of the program

The final step is the implementation of the planned operational programs. In this step, it is necessary to continuously monitor the implementation of programs to ensure their proper improvement. Furthermore, storing and maintaining information, resulting from the implementation of the programs, to knowledge management is important and useful for future managerial decision-making.

Since there is no endpoint to the productivity improvement and to deploy the productivity management cycle in the organization, at the end of the second phase and based on the obtained information, experiences and results, productivity indicators should be measured again (1st step of the first phase) and so on.

4. RESULTS

In this section, the findings resulting from the experience of implementing the proposed approach for a case study, are presented. For this purpose, the case study is briefly introduced, first. Finally, the findings are presented by the phases of the proposed approach.

4.1. Introducing the Case Study

The case studied in this research is the Telecommunication Infrastructure Company (TIC), which is responsible for the telecommunication network infrastructure in Iran. This company works as the governmental body of the ICT Ministry to create, develop, manage, organize, supervise, maintain and implement the main communication backbone of the country and continue its infrastructural activities. The main services of this company are:

- Providing bandwidth services
- Providing extra and passive services of communication infrastructure
- Providing voice interconnection's infrastructures

This company has over 1000 employees and in addition to the central headquarters located in Tehran, there are also companies operating at the provincial level, as subsidiary companies of TIC.

4.2. TIC's Current Productivity State

As mentioned before, this phase includes two following steps:

4.2.1. TIC's Productivity Indexes

To problem- and result-oriented measurement of the TIC's productivity state and its missions, the productivity indexes of this company are defined according to Table 1. The efficiency metrics are defined based on the well-known productivity indicators including labor force, capital productivity, and total factor productivity. Moreover, the effectiveness metrics which take into account the company's ability in achieving business goals and meeting governance expectations, contain both commercial and governance-related metrics. The first type of effectiveness metrics measures the company's annual profitability and the second type contains mission-oriented indicators, defined according to the following specific indicators:

- Round Trip Time (RTT)
- The variance of time delay/latency in a data network (Jitter)
- Packet Loss Rate (PLR)

Table 1. TIC's productivity indexes

Index	Type of index	Formula
Labor productivity index	Efficiency (Single-Factor)	$\frac{Value\ added}{\#\ of\ employees}$
Capital productivity index	Efficiency (Single-Factor)	$\frac{Value\ added}{Value\ of\ capital\ assets}$
The total factor productivity index	Efficiency (Total-Factor)	$\frac{Value\ added\ index}{(\#of\ employees\ index)^{\alpha} + (Capital\ stock\ index\ )^{\beta}}$ $\alpha = share\ of\ labor\ compensation\ in\ value\ added$ $\beta = share\ of\ capital\ stock\ in\ value\ added$
Profitability index	Effectiveness	$Net\ profit\ value$
Missional effectiveness index	Effectiveness	$Average\ of\ the\ normalized\ missional\ indexes$

To measure the productivity indexes, the financial statements of TIC and its annual performance reports are used.

4.2.2. TIC's Productivity Analysis

To understand the TIC's long-term directions and goals, the strategic plan of the company is studied. Accordingly, Figure 7 shows the main focus points, stated in TIC's long-term strategies.

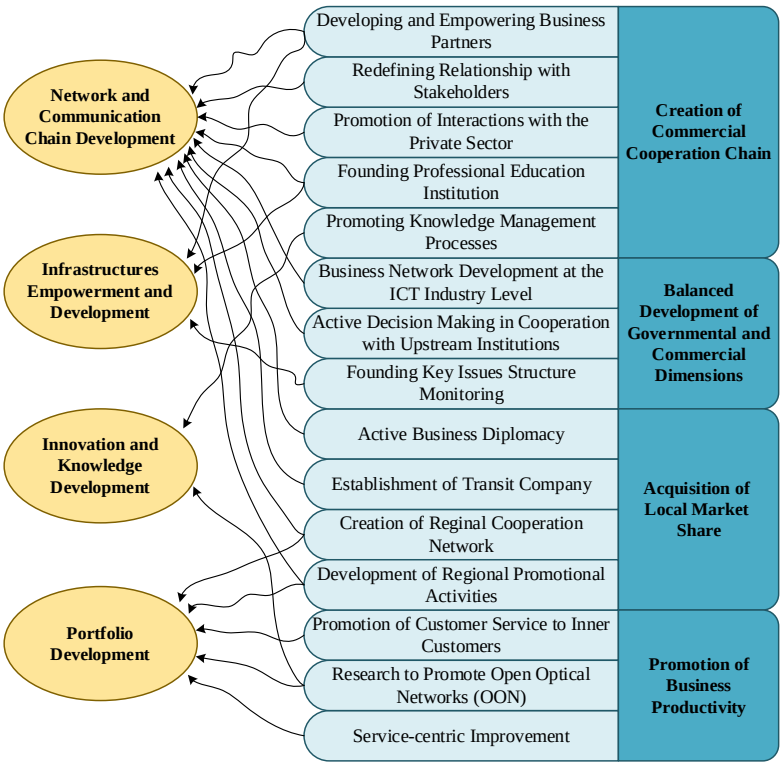

Figure 7. The main areas attended in TIC's strategies

Furthermore, to consider the upstream expectations from the productivity viewpoint, the company's related documents have been reviewed and the main areas of upstream interests, related to productivity issues, have been discovered. For this purpose, the thematic analysis technique is used. As a result, Figure 8 indicates the list of organizing productivity-related themes discovered from the upstream documents. These themes represent the main areas of requirements and expectations that should be considered by TIC to improve productivity.

Figure 8. Organizing productivity-related themes discovered from TIC's upstream documents

According to the main areas attended in TIC's strategies and the productivity-related themes, discovered from TIC's upstream documents, the effective areas on the company's productivity, are revealed, as shown in Figure 9. These areas will be examined in the next step, to analyze the current situation.

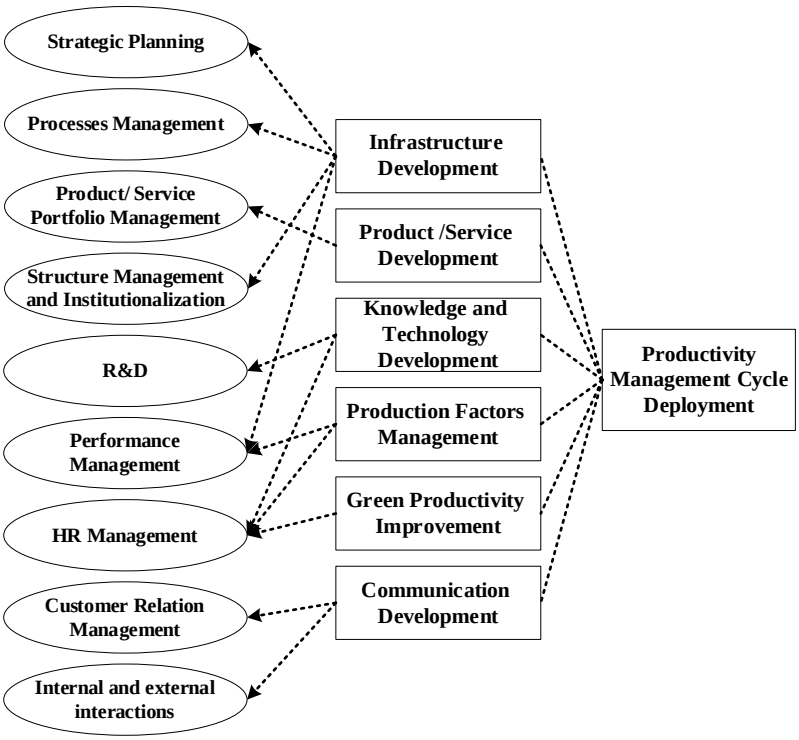

Figure 9. Areas affect TIC's productivity

Finally, to evaluate the organizational performance concerning the identified areas, the SWOT matrix (Strength, Weakness, Opportunity, Threat) is developed and analyzed based on the experts' opinions. Accordingly, strategic directions and approaches by which the TIC's organizational productivity can be improved, are determined as follow:

- Effective utilization of resources and capacities
- Elimination of internal weaknesses and improve the value-creation chain
- Development of the product and services portfolio
- Collaborative management and strengthening the communications chain

4.3. TIC's Productivity Improvement Action Plans

Figure 10 indicates the problem-oriented approach is used to define TIC's productivity problems.

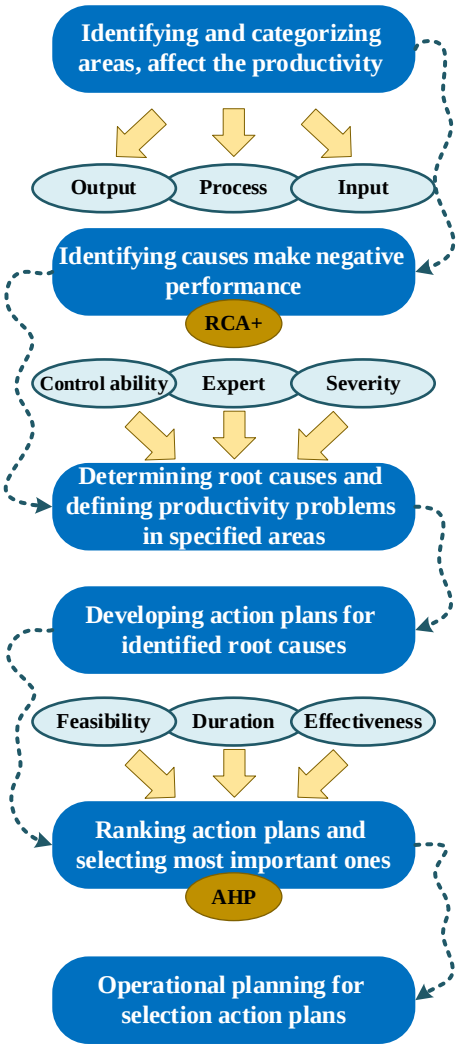

Figure 10. The process of TIC's productivity problem definition

4.3.1. Productivity Problem Definition in TIC

According to the identified areas that affect TIC's productivity state and with a systematic viewpoint, the initial subjects for TIC's productivity problems are determined, as stated in Table 2. Initial areas, identified previously, are categorized to form the general areas.

Table 2. General subjects for productivity problems in TIC

#	Initial Area	General Area (Systematic Viewpoint)
1	Human Resource	**Inputs and Production Factors**
2	Capitals	
3	Strategies	**Business Processes and Infrastructures**
4	Organizational Structure and Architecture	
5	Communication Network	
6	Process	
7	Performance Management	
8	Research and Develop	
9	Product/ Service Portfolio	**Outputs and Outcomes**

Also, Table 3 described the productivity problems for each general subject determined previously.

Table 3. Productivity Problems in TIC

#	Subject	General Area	Attribution	Problem
1	Human Resource	Inputs and Production Factors	Productivity	Low HR productivity
2	Capital	Inputs and Production Factors	Productivity	Low capital productivity
3	Performance	Business Processes and Infrastructures	Agility	Low agility
4	Product/ Service Portfolio	Outputs and Outcomes	Value-added	Low value-added

To analyze the root causes of the defined productivity problem, the RCA+ technique is used via the algorithm described in Figure 5. Accordingly, for each problem, the cause tree diagram is drawn and consequently, the root causes are identified with respect to experts' judgment. To determine the root causes among all identified causes, the following considerations are regarded:

- Extra-organizational causes, which are out of control, are discarded,
- The causes have multiple consequences and influence other causes, have priority to be selected as root causes,
- The causes, identified as root causes by experts, are selected to define the action plans

Finally, Table 4 states the root causes identified for each productivity problem. As shown in Table 4, each defined problem (Table 3) is analyzed using the RCA+ method and consequently, the root causes of the problems are discovered with respect to experts' judgment. A hierarchical cause tree diagram for each problem is figured, based on the RCA+ method and the root causes are determined. For example, more than fifteen causes are recognized of low labor productivity problem, and consequently, experts distinguished five causes as root causes for this problem, as shown in Table 4. Identification of the root causes of one problem makes it easier and more rational to solve this problem because dealing with these root causes leads to removing the barriers that created the problem. The action plan and score columns are described in Section 4.3.2.

Table 4. Productivity problems

General Area	Problem	Root cause	Action Plan	Score
Production Factors Productivity	Low labor productivity	The mismatch between skills and jobs	Develop job competencies and allocate appropriate labor force	0.14
		The inefficiency of the compensation system and poor employee performance management	Designing a performance-based compensation management system	0.27
		Poor development of the workforce and promotion of organizational culture	Measuring maturity and analyzing and managing the company's productivity culture	0.25
			Developing a job career model for the jobs	0.22
		Weakness in the knowledge management	Reengineering the knowledge management system with a value-added approach	0.13
	Low capital productivity	Ineffective management of capital assets	Designing a mechanism and managing the asset based on needs and feasibility	0.26
		Weakness in technical knowledge for using assets	Developing asset management procedures and workforce capabilities	0.21
		Lack of proper capacity building to meet demand	Investing in research and development to attract up-to-date technologies	0.20
		Existence of unused capacities due to changing market demand	Identifying and removing unused and demand-free capacities	0.33
Business Processes and Infrastructures	Low agility	Failure in cascading strategy	Cascading and deepening strategies to the level of general administrations	0.30
			Establishing Strategic Management Office (OSM)	0.23

General Area	Problem	Root cause	Action Plan	Score
		Need to strengthen the productivity structure	Developing pyramid structure for organizational productivity committees	0.18
		Lack of effective implementation of processes	Reengineering the mechanism of monitoring, analyzing, and improving processes	0.18
		No connection between the performance management system and other systems	Reengineering the performance appraisal model at different levels of the company	0.11
Outputs and Outcomes	Low value-added	Increasing energy consumption costs and, consequently, increasing costs	Establishing a green management system	0.22
		Low ancillary income due to inefficient use of existing capacities	Designing a mechanism to maximum use of existing capacities and potential	0.11
		Inefficient product portfolio management	Development of product and service portfolio based on market needs assessment and feasibility study	0.29
		Increased intermediate costs due to inefficient maintenance mechanism	Redesigning maintenance system	0.38

4.3.2. Development of Action Plans to Improve Productivity in TIC

To define solutions to deal with the identified root causes, the expert's and specialists' opinions are gathered, and accordingly, the action plans are determined, as shown in Table 4. As indicated in Table 4, an action plan for each root cause is introduced concerning experts' judgment. The experts are asked to present a solution to eliminating the identified root causes and, in this way, solve the defined problem.

With regard to the organizational limitations, it is decided to select one action plan for each problem. To rank the action plans, the AHP method is used, as indicated in Figure 6. Action plans are considered as options (alternatives). Also, three following criteria are defined to compare the options:

- Effectiveness: How much does the option affect the productivity level?
- Duration time: How long does the implementation take?
- Feasibility: How possible is this option?

Table 5 indicate the weight of each criterion based on experts' opinion.

Table 5. Weights of the AHP method's criteria

Criterion	Effectiveness	Duration	Feasibility	Weight
Effectiveness	1	3	2	**0.52**
Duration	0.34	1	0.34	**0.14**
Feasibility	0.5	3	1	**0.33**

Similarly, the last column of Table 4 indicates each action plan score, resulting from a pairwise comparison of the options concerning mentioned criteria. Finally, the red-colored action plans in the last column of Table 4 indicate the most important action plan for each problem (action plans with the highest score). These are the action plans that should be considered for more detailed planning and implementation.

4.3.3. Operational Planning

For each selected action plan, an operational improvement project is defined. Moreover, a project charter including project stakeholders, roles and responsibilities, goals and expectations, project implementation stages, project schedule, critical periods and milestones, and project implementation restrictions, have been prepared for each action plan. It should be noted, that continuous monitoring is necessary for this step to assure the effectiveness of implemented action plans and improvement projects.

To deploy the productivity management cycle, the feedback, gathered from previously implemented action plans should be analyzed besides measuring indexes and evaluating productivity again to execute the first phase of the proposed approach and so on.

5. CONCLUSION

In this study, with respect to the role of organizations in improving productivity and consequently, economic growth, a problem-oriented approach was proposed to deploy the productivity management cycle at the organizational level. The proposed approach contained two main phases including the analysis of the current state and productivity improvement planning.

The first phase consisted of two steps. The first step focused on defining metrics that measure organizational productivity based on both efficiency and effectiveness concepts. The second step concentrated on analyzing the current productivity state, in which, areas that affect the organizational productivity, were identified according to the organizational and extra-organizational expectations and goals Then, the organizational performance in these areas was evaluated. The output of this phase was the SWOT matrix for organizational performance including the strength and weakness points beside opportunities and threats.

The second phase contained three steps. Initially, based on the analysis resulting from the first phase, and concerning a systematic viewpoint, productivity problems were defined. Moreover, to have problem-oriented planning for productivity improvement, the root cause analysis using the root conflict analysis technique (RCA+) was conducted for each defined productivity problem. In the second step, according to the identified root causes and experts' judgments, action plans to deal with root causes were determined. Furthermore, the AHP method was used to prioritize the action plans for the organizational conditions and considerations and select the most effective action plans. Finally, in the third step, the implementation process for selected action plans was designed and project charters including responsible and accountable, milestones, project restrictions, and implementation steps were provided.

To ensure the efficacy of the proposed approach, the implementation of this approach for a real case, named Telecommunication Infrastructure Company (TIC), was studied. Findings resulting from this study indicate that the proposed approach can be used as a managerial tool for organizations and executive firms to deploy the productivity management cycle and help them to play a significant role in national economic growth.

REFERENCES

Ahadi Nia, N . (2005). Solutions increase productivity, Tadbir Journal, 157, 43-47.

Alimohammadpour, A., Zabihi, A., & Faghani Makrani, K. (2020). The Effect of Capital Productivity Management on Capital Asset Pricing Models with a Focus on Life Cycle. Productivity Management, 52, 171-194.

Altshuller, G.C. Creativity as an exact science: The theory of the solution of inventive problems.

APO. (2015). Handbook for SME Productivity Measurement and Analysis for NPOs. Asian Productivity Organization, Tokyo. Japan.

APO. (2021). APO Productivity Index: Measurement of Long-term Productivity Growth. Asian Productivity Organization, Tokyo. Japan.

Boyatzis, R. (1998). Transforming qualitative information: thematic analysis and code development. SAGE.

Caliendo, L., Mion G., Opromolla, L.D., Rossi-Hansberg, E. (2020). Productivity and Organization in Portuguese Firms. Journal of Political Economy, 128 (11)

Chukwulozie, O.P. (2018). Quality and Productivity Management. Proceedings of the World Congress on Engineering and Computer Science, San Francisco, USA.

Cox, L.K. (2021). How to Stop the Most Common Productivity Prohibitors [Infographic]. Available from: https://blog.hubspot.com/.

Dieppe, A. (2021). Global Productivity: Trends, Drivers, and Policies. Washington, DC: World Bank. World Bank.

Diwas, K.C. (2020). Worker Productivity in Operations Management. Foundations and Trends in Technology, Information and Operations Management, 13 (3).

German Council of Economic Experts. (2020). Productivity: Improving conditions for growth. Annual Report (Chapter 2), 84-136.

Hajihassaniasl, S. (2019). Efficiency and productivity growth in Iran's economic sectors using data envelopment analysis. Economics and Politics, Wiley. 123-129.

Jeseviciute-Ufartiene, L. (2014). Importance of Planning in Management Developing Organization, Journal of Advanced Management Science, 2(3), 176-180.

Kim, E. (2009). TRIZ-based Problem Definition Process for Creative Problem Solving. Computer Science.

Lajevardi, F., Rahiminiya, S., Mortazavi, S., & Kordnaeij, A. (2015), Cognition Mind Patterns of Expert in Public Organisation of the Country: Promotion or Lack of Promotion of Human Resource Productivity of Public Sector. Productivity Management, 30, 141-165.

Linna, P.,, Sanna P., Juhani U., & Helina M. (2010). Defining and measuring productivity in the public sector: managerial perceptions. International Journal of Public Sector Management, 23 (3), 300-320.

OECD. (2021). Measuring Productivity - OECD Manual: Measurement of Aggregate and Industry-level Productivity Growth. OECD Library.

Oraee, K. (2014). Productivity from concept to practice. Amirkabir University of Technology Publication (First Edition), Tehran, Iran.

Madani, K. (2021). Have International Sanctions Impacted Iran's Environment? World, 2, 231–252.

Nasrollahniya, M. Madahi, M. E. & Rahmani zadeh, F. (2014). Performance Evaluation of productivity growth and some member countries of the Asian Productivity. Financial knowledge of securities analysis, 7(23): 109-123. (In Farsi).

NIPO. (2021). Evaluation Method of Productivity of Governmental Organs. National Productivity Organization of I.R. Iran (In Farsi).

Pekuri, A., Haapasalo, H., Herrala, M. (2011). Productivity and performance management - Managerial practices in the construction industry. International Journal of Performance Measurement, 1, 39-58.

Petrov, V. (2019). TRIZ. Theory of Inventive Problem Solving: Level 1. Springer.

Phusavat, L. (2013). Productivity Management in an Organization: Measurement and Analysis. To Know Press.

Pissourios Ioannis A., (2014). Top-Down and Bottom-Up Urban and Regional Planning: Towards a Framework for The Use of Planning Standards. European Spatial Research and Policy, 21(1), 1-17.

Rahmati, M., & Pilehvari, A. (2018). The productivity trend in Iran Evidence from manufacturing firms. Economics of Transitions and Institutional Change. 27 (2), 395-408.

Ross, M. (2019). The productivity problem: causes, consequences, and cures. Available from: https://www.globalgovernmentforum.com/.

Saaty, T., & Kirti P. (2008). Group Decision Making: Drawing out and Reconciling Differences. Pittsburgh, Pennsylvania: RWS Publications.

Sabouri, M., & Rasouli, R. (2016). The challenge for government management efficiency in Iran. 2nd Conference on New Ideas in Management, Economics & Accounting, Singapore.

Seifollahi, N. (2021). The Effects of Knowledge Management Dimensions on Organizational Productivity: The Case of Tabriz Petrochemical Company. Productivity Management, 2 (57), 139-156.

Shekari, A., Rahimi, M. (2012). Productivity Management and Improvement. RASA (First Edition, In Farsi). Tehran.

Souchkov, V. (2005). Root Conflict Analysis (RCA+): Structured Problems and Contradictions Mapping. ETRIA Conference TRIZ Future, Graz, Austria.

Souchkov, V. (2007). Application of Root Conflict Analysis (RCA+) to Formulate Inventive Problems in the Maritime Industry. Scientific Journals of the Maritime University of Szczecin, 51, 9-17.

Starovoytova Madara, D. (2015). Theory of inventive problem solving (TRIZ): his story. International Journal of Innovative Science, Engineering & Technology, 2 (7), 86-95.

Sumanth, D. (1988). Productivity Engineering and Management: Productivity Measurement, Evaluation, Planning, and Improvement in Manufacturing and Service Organization. McGraw-Hill Book Company.

Syverson, C. (2011). What Determines Productivity? Journal of Economic Literature, 49 (2), 326–365.

Taifa, I., Vhora, T. (2019). Cycle time reduction for productivity improvement in the manufacturing industry. Journal of Industrial Engineering and Management Studies, 6(2), 147-164.

Tangen, S. (2005). Demystifying productivity and performance. International Journal of Productivity and Performance Management, 54 (1), 34-46.

The Law on the Sixth Five-Year Economic, Cultural and Social Development Plan for 1396-1400 (2016-2021).

Yilma Goshua, y., Kitawb, d., Matebu a. (2017). Development of Productivity Measurement and Analysis Framework for Manufacturing Companies. Journal of Optimization in Industrial Engineering, 22, 1-13

Yin, R. (2003). Case Study Research: Design and Methods. Applied Social Research Methods Series (Third Edition). SAGE.

Zeraatkar, S., Rajabi farjad, H., & Naghashzadeh S. (2020). Exploration of the Challenges of Human Resource Management in the Public Sector and Their Effects on Productivity. Scientific Journal of Research in Human Resources Management, 12 (3), 197-224.