IT GOVERNANCE TURKEY

2021

TECHNOLOGY

〈 **Governance** 〉

And Trends

FOREWORD

Today's world; With the effect of globalization, technology, innovation, competition and digital transformation, the way of doing business in organizations is constantly changing. These challenges in the market lead to a renewal of concepts, methodologies and frameworks. In addition, these methodologies and frameworks are constantly updated and published to guide the use of organizations.

As IT Governance Turkey team, in this book; we mentioned about popular methodologies and frameworks used in the execution of projects and processes, and current technology trends from a governance perspective. Our aim is to contribute to the knowledge of our readers.

We would like to mention that; We are not professionals; our book is a professional work of teamwork with an amateur spirit. Our writers came together completely digitally during the pandemic period, they never knew each other before and still have not come face to face. With the initiative they took, our authors came together under the roof of IT Governance Turkey.

This book; It is one of the best examples of digital workgroups, self-organizing, self-managing teams with a sense of responsibility.

We hope that this book, which we have written with the method of co-authorship without knowing each other, becomes a guide for our readers, for today's business world.

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CHAPTER 1

1. GOVERNANCE

1.1. WHAT IS GOVERNANCE?

With the effect of globalization; social, economic, political, technological developments and innovations experienced throughout the world have affected the field of management as well as in every field, and have caused the emergence of new concepts, understandings and organizations in the field of management and the existing concepts, understanding and organizations to change and transform at an incredible speed.

Relationships between participants and management have begun to reshape and the concept of "management" has changed. This new management understanding has taken its place in Turkish as "governance" since it includes the concept of "mutual interaction" between the governing and the governed.

"Governance" in terms of word meaning; It has emerged with the addition of "reciprocity" to the word management. For example, the act of "hitting" is an act of one person unilaterally, while the act of "hitting each other " means that at least two people hit each other mutually. Similarly, while the word "management" is an act of a person or a group alone, "governance" allows all existing participants to participate in the management work and to be part of this action.

In short, the concept of "governance" expresses the transformation from a relationship managed by one side to the whole of relations that emphasize mutual interaction, the understanding of "joint management".

The concept of governance was first used in a report of the World Bank on the development of Africa in 1989 with the statement "Private sector initiatives and market mechanisms are important, but they should be carried out with good governance." In Turkey in 1996, the second United Nations Human Settlements held in Istanbul (Habitat II) was used in the conference. With this new governance understanding; All institutions and individuals such as governments, public and private organizations, employees, women, men, children and youth started to be seen as partners, and it was emphasized that all segments of the society should take responsibility in solving problems and making decisions. The concept of governance finds application in many areas from law to politics, from public to private enterprises and international relations, and is seen as a prerequisite for sustainable development.

1.2.   GOOD GOVERNANCE

Governance is based on certain principles and good governance is maintained depending on how much these principles are adopted. In the White Paper prepared by the European Communities Commission in 2001, 5 principles that form the basis of good governance were emphasized as: Openness (Transparency), Participation, Accountability, Effectiveness and Coherence. In addition to these principles, different principles such as Responsibility, Fairness and Legal Commitment are included in different sources today.

It should be emphasized that, good governance is more closely related to how those principles and rules are perceived by authorized people and institutions and to what extent they are put into practice, rather than an objective that can be achieved by listing a set of principles and rules. Governance is also a culture that shapes managing-managed relationships; it is the road map that guides interactions; It is the method and style based on decision making, resource allocation, determination of priorities and conflict resolution processes.

THE PRINCIPLES OF GOOD GOVERNANCE;

- **Openness (Transparency):** It means that the authorities perform their decision-making processes and decisions in an equal, clear and understandable manner to other stakeholders. Decisions should be made in clear language and accessible to stakeholders.

The Principles of Good Governace

- **Participation:** Participation in the preparation and implementation of the projects gives the stakeholders the feeling of owning the projects and contributes to more successful results. Potential risks are recognized early and costs are reduced. Stakeholders involved in decision making undertake success and failure. Participation should not only be perceived as participation in the decision-making process, but also as informing stakeholders to be affected.

- **Accountability:** Who is authorized in the works to be carried out in the projects and their authority limits should be determined clearly. Stakeholders should undertake their responsibilities in decisions and practices made within the framework of their authority. If necessary, decisions and practices can be reconsidered, changed or reapplied.

- **Effectiveness:** Decisions and policies should be effective and timely, implemented in accordance with clearly defined goals, and assessed against possible future impacts and lessons learned in the past. Performance should be monitored and improvement studies should be done.

- **Coherence:** Decisions, policies and studies should be compatible with each other. Ensuring compliance ensures that the regulations made are predictable and that stakeholders can work more efficiently in an environment that they can trust.

- **Responsibility:** Stakeholders should assume their responsibilities in all processes of the work done. Openness, participation, accountability, effectiveness, coherence etc. requires strong responsibility.

- **Fairness:** It is ensured that decisions and policies are not made in favor of any part of the society and it is ensured that the rules governing stakeholders are clearly laid out and applied equally to everyone. This ensures that stakeholders have confidence.

- **Legal Commitment:** Decisions and policies must be compliant with the rules of law, adopted appropriately, applied impartially and audited by law. The rule of law must be recognized and established.

1.3.   THE SIX FUNCTION OF GOVERNANCE

To achieve good governance, it is necessary to integrate, control and balance the six functions of governance, as outlined below.

- **Determining the objectives of the organization;** expressed through its vision and mission statements and implemented through its strategic plan. The objectives define the purpose of the organization, and describe how the purpose will be fulfilled.

- **Determining the ethics of the organization;** defining what aspects of behavior are really important. An ethics policy defines the rules or standards for governing the behavior of the people who work in an organization. The board establishes a Code of Ethics, Code of Conduct, and Conflict of Interest policy, among other policies, which portray the aspects of corporate behavior they believe are

important to the health of the organization. Ethical standards are set by the top leaders, whereby they set the example for others to follow.

- **Creating the culture of the organization:** which refers to how people within the organization interact with each other. The governing body decides on what the culture should entail and top leaders are expected to model the culture they set by their acts, decisions, and behaviors. It's essential for all employees, volunteers, and other stakeholders to support the governance system because it has a great effect on the organization's culture. Various Issues can fall under the umbrella of culture including innovation, transparency, maturity, professionalism, risk tolerance, environmental, social, and governance issues, and much more.

- **Ensuring compliance by the organization**; All organizations must know and understand the laws and regulations that govern their organization. They have a legal obligation to work towards the best interest of the organization and the board must ensure that the organization is continually in good legal standing at all times. The board must ensure legal and regulatory compliance with working within their ethical and cultural framework.

- **Ensuring accountability by management:**
  - For the ethical and cultural environment, they develop and maintain within the organization.
  - For the stewardship of the resources.
  - For the accomplishment of the strategic plan and fulfilment of the organization's objectives.

- **Designing and implementing the governance framework for the organization.** The governing body is accountable for the performance of the organization, and retains overall responsibility for the organization it governs; however, in most organizations the governing body cannot undertake all of the work of governance itself. To ensure the efficient governance of the organization various responsibilities need to be delegated to people within the organization's management. The governance framework defines the principles, structures, enabling factors and interfaces through which the organization's governance arrangements will operate.

1.4.   WHAT IS IT GOVERNANCE?

IT governance is an integral part of corporate governance, which aims to improve the management of Information Technology and derive higher value from investment in information technology. So it can be said that it is a sub-branch of governance. In other words, it is a set of rules, regulations and policies that define and ensure that the IT unit operates in an effective, controlled and valuable manner.

IT Governance is a new concept but is still evolving. IT Governance is not just an IT issue or an issue that only concerns IT activities. For this reason, those primarily responsible for IT governance within the organization are the board of directors and senior management, not the IT manager. IT governance is a component of enterprise management. IT governance must be strategically addressed. That is, governance should be effective, transparent and accountable.

The main mission of IT governance is to harmonize the business objectives of the organization with the IT activities. This strategic compatibility between IT and corporate goals is a critical success factor today. Techniques with proven reliability and applicability in the industry are used in IT governance. These techniques ensure that the information technologies used support corporate goals, use resources more appropriately, manage risks appropriately and increase the effectiveness of business areas.

The use of IT has the potential to be the main driver of economic prosperity in the 21st century. IT is critical to corporate success, providing tools to increase productivity while providing opportunities to gain competitive advantage. Successfully leveraging IT to deliver value-added products and services in organizations has become a universal business competence.

5 focus areas for IT Governance have been determined by the IT Governance Institute. These areas are listed below.

- Strategic Alignment
- Value Delivery
- Risk Management
- Resource Management
- Performance Measurement

Three of the five focus areas of IT governance (strategic alignment, resource management, and performance measurement) are considered driving forces, and the other two (value delivery and risk management) are outcomes. Most IT governance models, frameworks, standards, and structures take into account these five focus areas during IT implementation. IT is not a one-off practice or something achieved by setting rules. IT Governance is the set of continuous activities that require continuous improvement and adaptation to the rapidly changing IT environment.

IT Governance Areas

1.4.1. STRATEGIC ALIGNMENT

The strategic alignment focus of IT governance aims to ensure that IT and business plans are interconnected, that both parties understand each other, and that business and IT operations are compatible. In order for corporate goals and IT governance plans to work together and benefit the organization, these two elements must be aligned. The IT value proposition must be defined, maintained and validated for true alignment to be realized.

The key question is whether an enterprise's investment in IT is in harmony with its strategic goals (purpose, current strategy, and enterprise goals) and therefore provides the capabilities needed to deliver business value. This state of harmony is referred to as "alignment." It is complex, multifaceted and never completely achieved. It is about continuing to move in the right direction and being better aligned than competitors. This may not be attainable for many enterprises because enterprise goals change too quickly, but it is nevertheless a worthwhile ambition because there is real concern about the value of IT investment.

IT and Enterprise Alignment
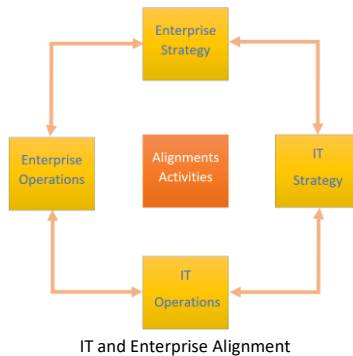
IT often is seen as a "necessary evil," but considered strategically it can provide enterprises with the opportunity to:
• Add value to products and services
• Assist in competitive positioning
• Contain costs and improve administrative efficiency
• Increase managerial effectiveness

When formulating the IT strategy, the enterprise must consider:
• Business objectives and the competitive environment
• Current and future technologies and the costs, risks and benefits they can bring to the business
• The capability of the IT organisation and technology to deliver current and future levels of service to the business, and the extent of change and investment this might imply for the whole enterprise
• Cost of current IT and whether this provides sufficient value to the business
• The lessons learned from past failures and successes

Once these issues are clearly understood, the IT strategy can be developed to ensure all elements of the IT environment support the strategic objectives. It is important that the plan for implementing the strategy be endorsed by all relevant parties. It is also important that the implementation plans be broken down into manageable parts The board should ensure that the strategy is reviewed regularly in the light of technological and operational change.

IT Supporting Strategic Objectives

Hence the board, or a dedicated IT strategy committee of the board, should drive business alignment by:

• Ensuring that IT strategy is aligned with business strategy and tha distributed IT strategies are consistent and integrated.
• Ensuring that IT delivers against the strategy (delivering on time and within budget, with appropriate functionality and the intended benefits—a fundamental building block of alignment and value delivery) through clear expectations and measurement (e.g., balanced business scorecard).
• Balancing investments between systems that support the enterprise as is, transform the enterprise or create an infrastructure that enables the business to grow and compete in new arenas.

- Making considered decisions about focus of IT resources, that is, their use to break into new markets, drive competitive strategies, increase overall revenue generation, improve customer satisfaction and/or assure customer retention.

As IT becomes more critical for enterprise survival in addition to enabling growth, IT strategy committees need to broaden their scope. Not only should they offer advice on strategy when assisting the board in its IT governance responsibilities, but also they should focus on IT value, risks and performance.

1.4.2.   VALUE DELIVERY

The value delivery focus area of IT governance deals with the benefits of IT according to business strategy. It addresses issues in IT project cycles, such as the costs of IT and how IT can provide solutions to lower costs and generate more revenue for the organization.

The basic principles of IT value are the on-time and within-budget delivery of appropriate quality, which achieves the benefits that were promised. In business terms, this is often translated into: competitive advantage, elapsed time for order/service fulfilment, customer satisfaction, customer wait time, employee productivity and profitability. Often, top management and boards fear to start major IT investments because of the size of investment and the uncertainty of the outcome. For effective IT value delivery to be achieved, both the actual costs and the return on investment need to be managed.

Therefore, IT needs to be aligned to deliver value so that it supports the enterprise as is by delivering on time, with appropriate functionality and achievement of the intended benefits. Alignment of IT also provides value by delivering infrastructures that enable the enterprise to grow by breaking into new markets, increasing overall revenue, improving customer satisfaction, assuring customer retention and driving competitive strategies. Enterprise goals are unlikely to be achieved unless IT is delivering on strategy promises.

The capacity to deliver is dependent on:
- Timely, usable and reliable information about customers, processes, markets, etc.
- Productive and effective practices (performance measurement, knowledge management, etc.)
- The ability to integrate technology.

To be successful, enterprises need to be aware that different strategic contexts require different indicators of value. This means that it is important to establish the value measures in concert between the business and IT. Many of these elements are subjective or difficult to measure, something that all stakeholders should understand. Therefore, the IT balanced scorecard should cover these measures and be developed

with input and approval from business management. It should also be mentioned that the public sector has different value drivers/indicators than the private sector. In the public sector, measures like compliance and due diligence take prominence over financial measures such as profitability.

1.4.3. RISK MANAGEMENT

The risk management focus area of IT governance relates to the risk awareness of senior managers in the organization, transparently concerned with understanding the organization's willingness to address key risk and compliance requirements. Senior management leads high risk awareness in the organization against numerous influences from inside and outside the organization. The responsible parties should develop potential risks that could affect business strategies. In addition, management must transmit risk transparency to others and instill risk management responsibilities in employees.

Increased risk management activities in organizations are an integral part of good corporate governance. The organization must address risk in many forms, not just financial risk. Especially operational and systemic risks, such as where technology risk and information security problems come to the fore. For example; all major past risk issues explored in the financial sector; caused by breakdowns in internal control, oversight and IT. Infrastructure protection initiatives in the USA and the UK point out that all organizations are completely dependent on IT infrastructures and are vulnerable to new technological risks The first recommendation these initiatives make is for risk awareness of senior corporate officers.

Therefore, the board should manage enterprise risk by:

- Ascertaining that there is transparency about the significant risks to the enterprise and clarifying the risk-taking or risk-avoidance policies of the enterprise (i.e., determining the enterprise's appetite for risk)
- Being aware that the final responsibility for risk management rests with the board so, when delegating to executive management, making sure the constraints of that delegation are communicated and clearly understood.
- Being conscious that the system of internal control put in place to manage risks often has the capacity to generate cost-efficiency.
- Considering that a transparent and proactive risk management approach can create competitive advantage that can be exploited
- Insisting that risk management be embedded in the operation of the enterprise, respond quickly to changing risks and report immediately to appropriate levels of management, supported by agreed principles of escalation (what to report, when, where and how)

Effective risk management begins with a clear understanding of the enterprise's appetite for risk and a brainstorming session on the high-level risk exposures of the

enterprise. This focuses all risk management effort and, in an IT context, impacts future investments in technology, the extent to which IT assets are protected and the level of assurance required.

Having defined risk appetite and identified risk exposure, strategies for managing risk can be set and responsibilities clarified. Dependent on the type of risk and its significance to the business, management and the board may choose to:

- Mitigate—Implement controls (e.g., acquire and deploy security technology to protect the IT infrastructure).
- Transfer—Share risk with partners or transfer to insurance coverage
- Accept—Formally acknowledge that the risk exists and monitor it.
- Avoiding - Avoiding risking work so as not to take risks if necessary.

As a minimum, risk should at least be analysed, because even if no immediate action is taken, the awareness of risk will influence strategic decisions for the better. Often, the most damaging IT risks are those that are not well understood.

1.4.4. RESOURCE MANAGEMENT

Information technology resource management deals with the management and investment of IT resources, including people, applications, hardware and data.

A key to successful IT performance is the optimal investment, use and allocation of IT resources (people, applications, technology, facilities, data) in servicing the needs of the enterprise. Most enterprises fail to maximise the efficiency of their IT assets and optimise the costs relating to these assets. In addition, the biggest challenge in recent years has been to know where and how to outsource and then to know how to manage the outsourced services in a way that delivers the values promised at an acceptable price.

Boards need to address appropriate investments in infrastructure and capabilities by ensuring that.

- The responsibilities with respect to IT systems and services procurement are understood and applied.
- Appropriate methods and adequate skills exist to manage and support IT projects and systems
- Improved workforce planning and investment exist to ensure recruitment and, more important, retention of skilled IT staff
- IT education, training and development needs are fully identified and addressed for all staff
- Appropriate facilities are provided and time is available for staff to develop the skills they need

It should be considered whether the existing methods and capabilities used in the organization are sufficient for the wise use of IT resources. It should be noted that the benefit obtained with any service is available and usable for a different service.

In most enterprises, the biggest portion of the IT budget relates to ongoing operations. Effective governance of IT operational spending requires effective control of the cost base: the IT assets and their focus where they are needed most. Enterprises should align and prioritise the existing IT services that are required to support business operations based on clear service definitions. These definitions and related performance metrics enable business-oriented service level agreements providing a basis for effective oversight and monitoring of both internal and outsourced IT services.

The IT assets should be organised optimally so that the required quality of service is provided by the most cost-effective delivery infrastructure. Companies that achieve this not only realise great cost savings but also are well placed to take on the next new IT initiative, judiciously introducing new Technologies and replacing or updating obsolete systems.

IT assets are complex to manage and continually change due to the nature of technology and changing business requirements. Effective management of the life cycle of hardware, software licences, service contracts and permanent and contracted human resources is a critical success factor not only for optimising the IT cost base, but also for managing changes, minimising service incidents and assuring a reliable quality of service.

Of all the IT assets, human resources represent the biggest part of the cost base and, on a unit basis, the one most likely to increase. It is essential to identify and anticipate the required core competencies in the workforce. When these are understood, an effective recruitment, retention and training programme is necessary to ensure that the organisation has the skills to utilise IT effectively to achieve the stated objectives.

The ability to balance the cost of infrastructure assets with the quality of service required (including those services provided by outsourced external service providers) is critical to successful value delivery. It is also a powerful reason for adopting sound performance measurement systems like the balanced scorecard.

1.4.5.   PERFORMANCE MEASUREMENT

The performance measurement focus of IT governance is about tracking and monitoring strategies, processes and services to evaluate performance and goal achievement.

Value creation tools have shifted from tangible assets to intangible assets, and intangible assets often cannot be measured with conventional financial instruments.

Strategy has taken on a new priority as enterprises use intangible assets to compete in an information-based global economy. In the information age where customer focus, process efficiency, learning and growth ability are prioritized; achieving targets with a performance measurement system that measures knowledge-based assets to compete is possible with a strategy that goes beyond traditional accounting. With the use of balanced scorecards, strategy is turned into action.

Each perspective is designed to answer one question about the enterprise's way of doing business:

- **Financial perspective;** To satisfy our stakeholders, what financial objectives must we accomplish?
- **Customer perspective**; To achieve our financial objectives, what customer needs must we serve?
- **Internal process perspective**; To satisfy our customers and stakeholders, in which internal business processes must we excel?
- **Learning perspective**; To achieve our goals, how must our organisation learn and innovate?

By using the balanced scorecard, managers rely on more than short-term financial measures as indicators of the company's performance. They also take into account such intangible items as level of customer satisfaction, streamlining of internal functions, creation of operational efficiencies and development of staff skills. This holistic view of business operations contributes to linking long-term strategic objectives with shortterm actions.
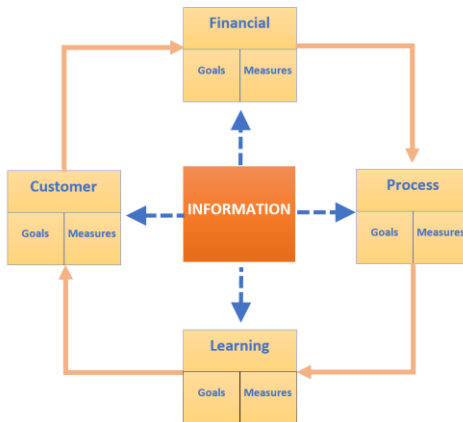
An Example of Balanced Scorecard

At the heart of these scorecards is management information supplied by relevant stakeholders and supported by a sustainable reporting system.

But IT does more than provide information to obtain a global picture as to where the enterprise is and where it is going. IT also enables and sustains solutions for the actual goals set in the financial (enterprise resource management), customer (customer relationship management), process (intranet and workflow tools) and learning (knowledge management) dimensions of the scorecard.

Use of an IT balanced scorecard (IT BSC) is one of the most effective means to aid the board and management to achieve IT and business alignment. The objectives are to establish a vehicle for management reporting to the board, to foster consensus among key stakeholders about IT's strategic aims, to demonstrate the effectiveness and added value of IT and to communicate about IT's performance, risks and capabilities.

To apply the balanced scorecard concepts to the IT function, the four perspectives need to be redefined. An IT BSC template can be developed by considering the following questions:

• **Enterprise contribution:** How do business executives view the IT department?
• **User orientation:** How do users view the IT department?
• **Operational excellence:** How effective and efficient are the IT processes?
• **Future orientation:** How well is IT positioned to meet future needs?

To demonstrate the value IT delivers to the business requires cause-andeffect relationships between two types of measures throughout the scorecard. These measurements are outcomes measures ((measuring what you have done)) and performance drivers (measuring how you are doing). A well-developed IT BSC contains a good mix of these two types of measures, and should link to the higher-level business scorecards.

1.5.   AN IT GOVERNANCE IMPLEMENTATION PLAN

To get its IT governance initiatives headed in the right direction, the enterprise needs an effective action plan that suits its particular circumstances and needs.

First, it is important for the board to take ownership of IT governance and set the direction management should follow.

This is best done by making sure that the board operates with IT governance in mind:

• Making sure IT is on the board agenda
• Challenging management's activities with regard to IT, to make sure IT issues are uncovered
• Guiding management by helping it to align IT initiatives with real business needs, and ensuring that it appreciates the potential impact on the business of IT-related risks

- Insisting that IT performance be measured and reported to the board
- Establishing an IT strategy committee with responsibility for communicating IT issues between the board and management
- Insisting that there be a management framework for IT governance based on a common approach (e.g., COBIT)

With this mandate and direction in place, management then can initiate and put into action an IT governance approach. To help management decide where to begin and to ensure that the IT governance process delivers positive results where they are needed most, the following steps are suggested:

1. **Set up a governance organisational framework** that will take IT governance forward and own it as an initiative, with clear responsibilities and objectives and participation from all interested parties.

2. **Align IT strategy with business goals**. What are the current business concerns and issues where IT has a significant influence, e.g., cost reduction, competitive advantage and/or merger/acquisition? Obtain a good understanding of the business environment, risk appetite and business strategy as they relate to IT. Identify the top IT issues on management's agenda.

3. **Understand/define the risks**. Given top management's business concerns, what are the risk indicators relating to IT's ability to deliver against these concerns? Consider:
   - Previous history and patterns of performance
   - Current IT organisational factors
   - Complexity and size/scope of the existing or planned IT environment
   - Inherent vulnerability of the current and planned IT environment
   - Nature of the IT initiatives being considered, e.g., new systems projects, outsourcing considerations, architectural changes

4. **Define target areas**. Identify the process areas in IT that are critical to managing these risk areas. Use the COBIT process framework as a guide.

5. **Analyse current capability and identify gaps**. Perform a maturity capability assessment to find out where improvements are needed most. Use COBIT's management guidelines as a guide.

6. **Develop improvement strategies**. Decide which are the highest priority projects that will help improve the management and governance of these significant areas. This decision should be based on most potential benefit and ease of implementation, and a focus on important IT processes and core competencies. Define specific IT governance projects as the first step in the IT governance continuous improvement initiative.

7. **Measure results**. Establish a balanced scorecard mechanism for measuring current performance. Monitor the results of new improvements considering, as a minimum, the following key considerations:
   - Will the organisational structures support strategy implementation?
   - Are responsibilities for risk management embedded in the organisation?
   - Do infrastructures exist that will facilitate and support the creation and sharing of vital business information?
   - Have strategies and goals been communicated effectively to everyone who needs to know within the organisation?

8. **Repeat steps** 2-7 on a regular basis.

There are also some obvious but pragmatic rules that management ought to follow:
   - Treat the IT governance initiative as a project activity with a series of phases rather than a "one-off" step.
   - Remember that IT governance involves cultural change as well as new processes, and therefore a key success factor is the enablement and motivation of these changes.
   - Make sure there is a clear understanding of the objectives.
   - Manage expectations. In most enterprises, achieving successful oversight of IT will take some time and is a continuous improvement process.
   - Focus first on where it is easiest to make changes and deliver improvements. Build from there one step at a time.

1.6. IT GOVERNANCE AS A RESULT

The IT governance framework helps the management level understand the problems and strategic importance of IT, helps ensure that the organization can maintain its activities and implement the strategies needed to expand its activities into the future. Provides assurance that IT expectations are met and IT risks are addressed.

IT governance provides broad governance arrangements that cover the relationships between all stakeholders, including the organization's governing body. It provides the structure in which the general goals of the institution are determined, outlines the method of achieving these goals and determines the method by which performance will be monitored.

Özetle, BT yönetişimi, BT hedeflerinin karşılanmasını ve BT risklerinin azaltılmasını sağlayarak BT'nin işletmeyi sürdürmek ve büyütmek için değer sunmasını sağlar. BT yönetişimi, BT ile kuruluş arasındaki stratejik uyumu yönlendirir ve performans ölçümü sağlar.

BT, işin ayrılmaz bir parçasıdır. BT yönetişimi aynı zamanda kurumsal yönetişimin ayrılmaz bir parçasıdır.

CHAPTER 2

2. AGILE

2.1. WHAT IS AGILE ?

Agile Software Development is an iterative, incremental, self-organising, cross-functional and evolutionary group software development methodology.

Being agile means being effective and memorable. It is both light and sufficient. Openness is one way to stay memorable. Agility means maneuverability. It is the ability of an organization to react to changes in its environment faster than the speed of those changes. It is dynamic, context-specific, growth-oriented and harnessing aggressive change. It's about success and winning: being at the center of competitive storms that many companies fear, being successful in emerging competitive areas and gaining profits, market share, and customers.

2.2. AGILE SOFTWARE DEVELOPMENT

In many development methods, especially in plan-driven ones, work begins with requesting a complete set of requirements and documentation. Beginning in the mid-1990s, there were many software professionals who found this Requirements Documentation phase frustrating and perhaps impossible. Both the technology and the business environment continued to change even during the project, and the requirements and project plans were out of date even with relatively short projects. Customers were no longer able to predict their needs beforehand. Practitioners had to develop methodologies and practices to adopt rather than reject higher exchange rates for software development. Winning in the business world goes arm in arm with winning in the software development game.

Traditional approaches have assumed that, if we try hard enough, we can predict that all requirements will come true early, and that we can reduce costs by eliminating change. Today, eliminating change early means not responding to business conditions. Similarly, traditional process management; works for continuous measurement, defect identification and process improvements. This approach assumes that the changes that occur are due to mistakes made. Today, although process problems certainly cause some errors, external environmental changes cause the main critical factors. Since we cannot eliminate this situation, lowering the cost of responding to them is the only viable strategy. But we must be careful not only to adapt to change, but also to maintain quality.

Agile methods are a response to this expectation. The strategy is to lower the cost of change throughout a project. For example, Extreme Programming (XP) requires the software development team to:

• To produce the first delivery within weeks to get an early acquisition and rapid feedback,
• Uncovering fewer elements to change by generating simple solutions. It will be easier to make these changes;
• Making the next process less costly by continuously improving the design quality;
• Continuous error detection for a chance to intervene earlier and cheaper.

2.3.   AGILE MANIFESTO

Agile software development (ASD) is a new approach in software engineering advocated by a group of 17 software professionals who share the common values of software development. These staff members, unlike Silo Development, collaborate closely between software development and business teams; face-to-face communication rather than with an excessive emphasis on written documentation as in traditional software development projects; delivery of parts of the running software rather than final product delivery; They advocated to focus entirely on the changing needs of customers, rather than determining the constant requirements and adaptable organizational capabilities of the teams according to the changing business requirements.

In February 2001, 17 advocates of this Agile philosophy came together in Snowbird, Utah, to discuss the similarities in their experiences and their methodology at the time. Finding that their work habits are very common, they realized that the working process provides a means to reach a more relevant outcome: customer satisfaction and high quality. They classified their methodology as "Agile" and prepared a Manifesto for Agile Software Development (ASD). After 2001, many software experts were inspired by the philosophy of ASD through the Manifesto.

The software personnel who created the manifesto specifically mentions four stages of values and 12 principles. The manifesto begins with these four-stage value elements:

Individuals And Interactions Over Processes and Tools
Working Software Over Comprehensive Documentation Customer
Collaboration Over Contract Negotiation
Responding To Change Over Following A Plan

In the manifesto, they stated that they value the places highlighted in bold colors more. They include the following points in their principles:

• Our top priority is customer satisfaction with early and continuous delivery of valuable software.
• Welcome changing requirements even at a late stage of development. Agile processes differ for the customer's competitive advantage.

• Distribute study software frequently, over a shorter timescale, from a few weeks to several months.
• Business people and developers should work together every day throughout the project.
• Develop projects on highly motivated people. Give them the environment and support they need and rely on them to do the job.
• The most effective method of conveying information to the development team is to talk face to face.
• Working software is the main measure of progress. Agile processes support sustainable development. Sponsors, developers and users must be able to maintain a steady pace indefinitely.
• Constant attention to technical excellence and good design enhances agility.
• Simplicity - the art of maximizing the amount of work that is not done - is essential.
• The best architecture, needs and designs arise from self-organizing teams.
• The team regularly focuses on how it can be more effective, adjusts and adjusts its behavior accordingly.

First of all, the agile movement emphasizes the relationships of software developers and the human role that is reflected in the community and contracts, as opposed to institutionalized processes and development tools. In current agile practices, this manifests itself in close team relationships, close work environment arrangements, and other procedures that increase team spirit.

Secondly, the vital goal of the software team is to constantly reveal tested running software. New versions are produced at frequent intervals. Developers are asked to keep this code as simple, straightforward, and technically advanced as possible, thus reducing the document load to an appropriate level.

Thirdly, although the importance of well-prepared contracts increases at the same pace with the size of the software project, the relationship and cooperation between developers and customers is preferred over rigid contracts. The negotiation process itself should be seen as a means of achieving and maintaining a sustainable relationship. From a business perspective, agile development focuses on delivering business value from the start of the project, thereby reducing the risks of non-compliance.

Lastly, the development team, consisting of both software developers and customer representatives, must be knowledgeable and competent to tackle possible adjustment needs that may arise during the development lifecycle. This means that participants are ready to make changes while existing contracts are created with tools that support and allow these improvements.

2.4.   AGILE ELEMENTS

In order to achieve success in Agile Software Development, a number of factors should be considered:

• **Customer Oriented Working Conditions:** The Agile Manifesto advocates customer collaboration as one of the important conditions for software development to be successful. For this, the customer should consider not only as a software development team, but also as an extremely active and responsible element in the project. Therefore, customer commitment is an important success factor.

• **Decision Time:** Agile applications are among the methodologies where possible success is achieved in environments that are filled with efficient communication. Fast communication can shorten the time spent on big decisions. Timing is an important factor. To be successful, it is important to shrink the requirements and divide the whole time into short periods.

• **Team Breakdown:** Teams located together are often considered one of the important tools for successful communication, and this is one of the key success parameters of software development. The geographic distribution and location of the teams is very important at this point, as local, political, cultural and behavioral habits and situations will greatly affect the productivity of the project team.

• **Team Size:** The number of members in a team greatly affects the level of communication between team members. In a team with a large number of members, frequent, informal and rapid interactions are likely to become difficult. Having a larger team can complicate the rapid communication and decision-making process in projects. For this reason, it is recommended that large teams be divided into small teams.

• **Corporate Culture:** Having the right corporate culture is a necessary element that determines the initiation of agile practices. Since agile practices emphasize "individuals and interactions on processes and tools" and "customer collaboration instead of contractual negotiations" (Agile Manifesto), the quality of institutions where individuals work is important. A dynamic and fast-changing organization will find ASD methods extremely suitable. As agile practices value customer collaboration and feedback, organizational culture must adapt to changes. The organizational culture should also support working in a collaborative environment. The organization must have the right culture, such as supporting rapid communication, dynamism in needs changes, trusting people and getting quick feedback from customers.

• **Planning and Maintenance:** One of the important aspects is characterizing the implementation of ASD practices is the nature of organizational, management and project planning and control. Documented plans accompanied by quantitative performance measures are considered as quite important parts of organizations implementing traditional / plan-driven software development. But in organizations

that adopt ASD practices, internalized plans and qualitative control prepared and followed by the team rather than external managers serve as a recipe to success.

2.5.   AGILE IN A NUTHSELL

The essence of agile software development is the use of light but adequate rules of project behavior and human and communication oriented rules. The Agile Software Development Series is based on software development techniques that are relatively lightweight, effective, human-assisted, and aimed at increasing the effectiveness of a person doing a certain job. The person in question can be anyone who designs the user interface, collects requirements, plans, designs or tests a project. Team closeness and intense interaction between team members are the hallmarks of all agile methods.

Agile methods emphasize two discrete concepts: the sharpness of the rules of work and the effectiveness of people working in good faith. The code of work shows what actually happens, rather than the promises made to developers and sponsors about what will happen in front of them. Working code can be submitted, changed, but it is always concrete. Using people ensures maneuverability and speed and effectiveness of cost savings. People can communicate ideas faster by talking face to face, writing and reading documents. A few designers sitting together can produce a better design than they can produce alone. When developers talk to clients and sponsors, they can clear up challenges and organize priorities. In leisure times, new methods can be developed by examining alternative ways in ways that are not possible. The key is to approach plan features rather than tasks as a priority. Dynamic prioritization means the customer can re-prioritize the desired features in the next cycle, skip the originally planned features and add new ones.

Because they are most applicable in turbulent, high-change environments, agile approaches suggest a variety of practices for continuous feedback on technical decisions, customer requirements, and management constraints. They encourage change rather than encourage it. In turbulent business conditions, the tolerance for change of a methodology should be determined by the rate of change of a particular environment, not by an internal view of the extent to which the change is acceptable.

Common to all agile methods is that software development is recognized as an empirical process.

Research has shown that traditional plan-oriented software development methodologies are not used in practice. It has been argued that traditional methodologies are too mechanical to be used in detail.

To wrap up, industrial software developers are skeptical of "new" solutions that are difficult to grasp and therefore unused. Agile software development methods began "officially" with the publication of the agile manifesto, trying to bring about a

paradigm shift in the field of software engineering. Agile methods claim to pay more attention to people, interaction, work software, customer collaboration and change, not processes, tools, contracts and plans.

A number of promising new methodologies have been put in place that claim to adhere to these agile principles. Additional evidence shows that agile methods are effective and suitable for many situations and environments. The available evidence consists mainly of success stories of applied professionals. Agile thinking is a human-centered perspective on software development. It has been argued that human-centered strategies are an important source of competitive advantage because unlike technology, cost, or new product development, these human strategies are difficult to imitate.

CHAPTER 3

3.   WATERFALL

3.1.   WHAT IS WATERFALL MODEL?

The Waterfall Model was first process model to be introduced. It is also referred to as a linear-sequential life cycle model. In a waterfall model, prior phase must be completed fully before the next phase can begin. Waterfall; It is the most popular version of the Software Development Life Cycle (SDLC) for IT projects. This type of software development model is basically used for the projects which are small and there are certain requirements.

The waterfall Model illustrates the software development process in a linear sequential flow. This means that any phase in the development process begins only if the previous phase is complete. In this waterfall model, the phases do not overlap. Sometimes it's planned using a Gantt chart, a type of bar chart that shows start and end dates for each task. Waterfall relies on teams following a sequence of steps and never moving forward until the previous phase has been completed. The needs may need to be reviewed and approved by the client before the team can move on to the next stage. The methodology, in its traditional form, leaves almost no room for unexpected changes or revisions. If your team is small and your projects are predictable, then Waterfall could provide the ideal framework.

3.2.   THE ADVANTAGE OF THE WATERFALL MODEL

The projects where Waterfall model is best used are simple, unchanging projects. Its linear and tough nature makes it easy to use and requires detailed documentations.

The Advantages are;

- **Easy to use and manage:** The Waterfall model is easy to use and understand as it follows the same sequential order for each project. The team doesn't need any prior knowledge or training before working on a Waterfall project. Waterfall is a solid pattern; Each phase has specific outputs and reviews, so it is easy to manage and control.

- **Discipline is enforced:** Every phase of Waterfall has a start and end point, and it's easy to share progress with stakeholders and customers. By focusing on requirements and design before writing code, the team can reduce the risk of missing any deadlines.

- **Early end-goal determination:** It is a defining feature of the Waterfall system that it commits to a goal and specifies the product at the beginning stages. The team must follow the hierarchy and should avoid deviating from the system. For small projects, the team working on the Waterfall is fully aware of the overall goal from the beginning. There is a less possibility of getting lost in detail as the scheme moves forward. Calculation of the deadline depends upon the duration and completion of each phase. The release date of the product and the final cost can be calculated prior to the development

- **High Visibility:** The output in the Waterfall model, after each phase, creates high visibility. By analyzing the output of each stage, it can be determined by the project manager and client that the project is making considerable progress.

- **Decrease in the number of problematic issues:** As the Waterfall model has different phases, the output of each phase is analyzed before it is sent to the next phase. This standard data supervision can reduce the risk of problematic issues.

- **The information is well transferred:** The approach of Waterfall is extremely systematic which makes the clean transfer of information at each phase or step. An organization with the right process can maximize the benefits of the Waterfall.

- **Quality Assurance Tests:** Quality assurance tests are performed before the completion of each phase. This includes validation and verification. If an error occurs on a certain stage, it is removed instantly, and the problem gets resolved.

- **It requires a well-documented approach:** Waterfall requires documentation for each phase, which provides a better understanding of the logic behind the code and tests. It also leaves a document for future projects or can be used if stakeholders need to see more details about a particular stage. Process and results are well documented.

- Works well for smaller projects where requirements are very well understood.

3.3. THE DISADVANTAGE OF THE WATERFALL MODEL

Because the waterfall model is a linear, sequential model, it cannot be switched between phases when unexpected changes occur. The disadvantages of the waterfall pattern:

- **Changes aren't easily implemented:** Once the team completes a stage, they can't go back. If they reach the test phase and a feature is found to be missing from the requirement phase, it would be very difficult and expensive to return and fix.

- **The software cannot be delivered until the very end:** The project must complete stages for coding to actually begin. As a result, stakeholders will not see software running until the end of its life cycle.

- **Gathering the right requirements can be difficult:** One of the first steps in a Waterfall project is talking to customers and stakeholders and defining their needs. However, it can be difficult to pinpoint exactly what customers want at such an early stage in the project. Often times, customers don't know what they want at such an early time, and instead learn and set requirements as the project progresses.

- **Risk and uncertainty is high:** Not suitable for the projects where requirements are at a moderate to high risk of changing.

- **Not suitable for complex projects:** Waterfall Model does not test complex and object-oriented models at every stage. Moreover, it does not remove the error during the process. Waterfall model, testing phase is the only stage which detects the error. Prior to the testing stage, there is no way to test if there are any mistakes or not. This is a major drawback of the Waterfall model because projects with moderate or high requirements are at increased risk of changing which cannot be done with this model.

3.4. THE PHASES OF THE WATERFALL MODEL

Waterfall approach was first SDLC Model to be used widely in Software Engineering to ensure success of the project. In "The Waterfall" approach, the whole process of software development is divided into separate phases. In this Waterfall model, typically, the outcome of one phase acts as the input for the next phase sequentially. To understand the Waterfall model thoroughly, one must have to know the details of its phases. All the phases work precisely and are independent of each other and all of them must occur sequentially. For example, if the development team is in the testing

phase, it cannot go back to the analysis phase. The following illustration is a representation of the different phases of the Waterfall Model.
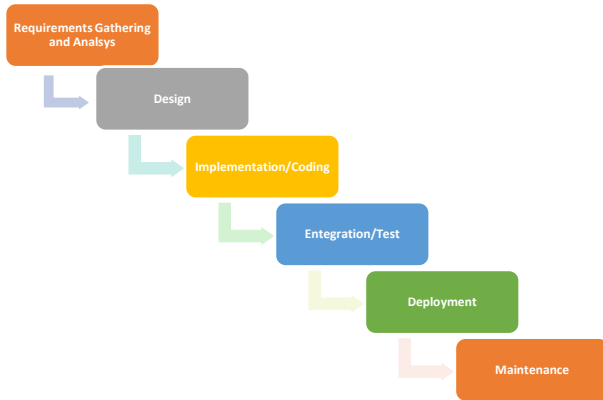
The Waterfall Model

The successive phases of the Waterfall model are:

- **Requirements Gathering and Analysis:** In this phase the requirements are gathered by the business analyst and they are analyzed by the team. At this stage the requirements are documented and explanations can be drawn. The Business Analysts document the requirement based on their discussion with the customer. The document containing the requirements to be developed is the output of this phase.

- **Design:** The requirement specifications collected in the previous step help to apply the technical design. The program design phase has various components (programming language, programming sequences and class libraries, etc.), including information architecture and applied technologies. The program design stage has various components (programming language, programming sequences and class libraries, etc.), including information architecture and applied technologies. Furthermore, it plans high-level technical details of the project. This stage diagrammatically records the output which describes the theoretical behavior of the software. The design features created at this stage are used in the coding stage to actually write the code.

- **Implementation/Coding:** The development team works on coding the project. Any flow chart or algorithm created during the design phase is translated into a programming language. With inputs from the system design, the system is first developed in small programs called units, which will be integrated in the next

phase. Each unit is developed for functionality and a test called Unit Test is performed.

- **Integration and Testing:** After the code is complete, the software needs to be tested for any errors. The testing team tests the complete application and identifies any defects in the application. These defects are fixed by the developers and the testing team tests the fixes to ensure that the defect is fixed. They also perform regression testing of the application to see if any new defects were introduced. When the test is finished, the software is delivered to the customer. Before deployment, some teams may include User Acceptance Test (UAT) where users test the software.

- **Deployment:** Once the functional and non-functional testing is done; the product is deployed in the customer environment or released into the market. The team installs the application on the servers . Some of the high level activities are installing the OS on the servers, installing security patches, hardening the servers, installing web servers and application servers, installing the database etc. They also co-ordinate with network and IT administrative teams etc. to finally get the application up and running on the servers.

- **Maintenance:** During the maintenance phase, the team ensures that the application is running smoothly on the servers without any downtime. Reported problems are fixed by the team after the software is released and tested by the test team. Issues that are reported after going live are fixed by the team and tested by the testing team. Patches can be released to fix problems or new versions can be released to improve the product. Maintenance is done to accommodate these changes in the customer environment.

3.5.   WHEN TO USE WATERFALL MODEL?

The waterfall model should be used when the customer can initially identify all their requirements and are clear on their requirements, and if the developer team can understand all the requirements of the customers as they start developing the software.

The waterfall model is mostly used in military etc. sectors, in long-term, critical projects where analysis and design are very important and the cost of making mistakes is very high. For example, in some military projects, the analysis and design stages in this model can take several years.

Additionally, the Waterfall Model is successful in meeting well-defined requirements when there is limited budget and / or timetable.

CHAPTER 4

4.   KAIZEN

4.1.   WHAT IS KAIZEN?

This approach, born from Japan, actually offers us great clues about Japanese culture. The deep assimilation of the philosophies of Buddhism, Confucianism, Taoism and Shintoism in the Japanese lifestyle has expanded beyond the individual, family, and community to organizational management and business practices. The result is that both understanding and behavior from home to work are not perfectly combined in Japan, and this is an obvious contradiction of homogeneity. Japanese-style managements display incentives on pressure. It includes wages and bonuses, lifelong employment, seniority-based wages, corporate welfare programs and in-house training. In the Japanese organization, human resource management is the most dynamic and important resource for future value. Hierarchy requires respect for title and seniority and authority; trust and relationships; avoiding conflict; and compliance. Also, the group direction is kept at the highest level.

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Kaizen serves as a management technique that employees should benefit from their daily routines. The entries combine the cultural and social boundaries of Japan with the creative need of the individual; outputs are concrete improvement tools and methods observed in the workplace. The Kaizen idea is quite simple: All employees in an organization have the capacity and will to contribute to the continuous improvement and improvement of existing activities. In practice, this means that every work team can hold meetings once a week where potential improvements are

discussed and possible solutions to problems are presented. Less motivated people can create a small but tangible improvement by using Kaizen tools, without allocating additional resources. This development can create satisfaction and self-confidence, which in turn guides the person towards more goal setting and motivation. The working team has the responsibility to implement the recommendations of its members.

Kaizen's daily work includes several heuristics such as diagrams, statistical tools, and analysis models. Since the Kaizen concept refers to highly practical activities, there is a great deal of room for local implementation of this general idea. For this reason, Kaizen is a concept that can perceive various team-based, employee-oriented activities.

4.2.   THE BIRTH OF KAIZEN

Kaizen originated in Japan in 1950, when the administration and government acknowledged that the current conflict management system was a problem and a pending labor shortage. It was first introduced by Maasaki Imai in 1986 to increase efficiency, productivity, and competitiveness, following the increasing competition and globalization pressure at Japanese automaker Toyota.

Since then, Kaizen has been part of the Japanese production system and has contributed greatly to production success. After the Kaizen concept was introduced by Imai (1986), successful factors for Kaizen or continuous improvement (CI), which is considered to be Kaizen in Western writing, have been explored. According to Imai, Kaizen is a continuous improvement process involving managers and employees. Kaizen is a broadly defined strategy. This is a strategy for incorporating concepts, systems, and tools into the big picture of customer-driven leadership and human culture. Imai claims that the ability to encourage employees to make a small and incremental improvement in in-store activities is the basis for excellence in Japanese manufacturing.

The importance that Kaizen attaches to the courtesy and correct implementation of duties, based on great respect for Confucian culture and social conventions; a preference for collectivism over individuality; It has been a matter of literally rebuilding Japan from its ashes. Kaizen refers to minor improvements as a result of ongoing studies. Innovation involves a significant improvement as a result of massive investment of resources in new technology or equipment. The author also explains that in the context of Kaizen, management has two basic functions: maintenance and improvement. Maintenance means activities aimed at maintaining existing technologies, management, and operating standards, and maintaining these standards through training and discipline.

4.3.   THE USE OF KAIZEN?

Kaizen literally stands for development and creativity in everyday life. The more advanced part; It offers a variety of tools to identify problems, find solutions, motivate employees and managers to participate in their activities, or manage planning, implementation, Review and goal setting cycles for further improvement. In industrial environments, it refers to the participation of management in the pursuit of excellence by combining the company's search for profit and competition, employee side skills, creativity, trust, and pride.

On the business side, management requires the sustainability of the organization, while competition requires financial profit as a motivation. Workers across the board need skills to gain knowledge and understanding; The creative product corresponds to social and cultural boundaries, but within organizational boundaries, Kaizen needs tools and equipment for the operation and improvement of tools and methods as well as human characteristics. The combination of these two elements - the venture side / employee side and the tools and methods - results in an energy that permeates the organization and creates a common mindset among employees to achieve proactive change and innovation. The proximity or elimination of one or more of these elements will directly affect the energy level and kaizen activity in the organization. Japanese culture provides directives for the purchase and development of developing tools and methods based in Japan and to activate the kaizen environment.

Kaizen increases productivity step by step, gradually and progressively. Although it is mainly used in the manufacturing sector, Kaizen increases productivity step by step, gradually and progressively. Although it is mainly used in the manufacturing sector, it has also been applied to health, education, public administration and other services, and can be applied to medium and large companies as well as micro and small enterprises. Helping the development of labor-intensive industries in labor-intensive countries, Kaizen has helped these countries achieve inclusive economic growth while reducing not only production costs but also cases of injury, machine breakdowns and delayed deliveries. It has improved morale and accountability. Such versatility gives it a philosophical image.

For the effective transfer of Kaizen, government and senior leaders assume important roles through a range of institutional arrangements, including increasing productivity, establishing and supporting the basic implementation organization, allocating sufficient resources, and the effects of a national movement that is driven by the strong determination of senior leaders needs to be supported. As Kaizen is a set of know-how applied in the industry, foreign direct investment can be a vehicle for transfer to developing countries. In fact, many Japanese private companies investing in Asian countries are spreading Kaizen in the region.

Workers tend to accept kaizen as both process-oriented and result-oriented, but predominantly process-oriented. Kaizen serves different purposes for different people. It loosens up the conceptual discourses of proactive change and improvement. Holistically, this allows you to understand what Kaizen really is.

People's understanding that kaizen has changed shows a real tolerance for individual interpretations, justifying the view that a universal view of Kaizen does not exist or should not exist, or may not exist. Change triggers are defined as organizational training and promotion programs and the accumulation of employee experience.

Japanese manufacturers have been known for their power in the world for years, thanks to the strategies they have established on the development and implementation of Kaizen's applications such as total productivity maintenance (TPM), total quality management (TQM), Toyota Production System (TPS). Today, the ultimate goal of manufacturing industries is to increase productivity through system simplification, organizational potential and incremental improvements using modern techniques such as Kaizen. Most manufacturing industries are faced with the imperative to respond to rapidly changing customer needs, desires and tastes.

Production system processes need to be continuously improved to remain competitive and maintain market share in this global market for industries. The path to the successful (continuous) implementation of Kaizen in western organizations can only be achieved through the implementation of formal and informal education and training. Formal training includes seminars and workshops covering in-house (rather than outsourcing) and on-the-job mentoring and leadership (both top-down and bottom-up). Training should be regular and consistent at all levels of the institution.

4.4.   TPS AS A KAIZEN SYMBOL

TPS (Toyota Production System) is a production system stemming from Toyota's extensive thinking to achieve cost competitiveness in a high-volume low volume production system.

The TPS is designed to ensure the survival of the company in the post-war small car market in Japan. TPS is quite different from Ford's famous production system. This system is the sequential mass production of a single product and leads to low-cost production and bulk sales at low cost. This is based on the assumption that it causes profits to increase.

In TPS, the stock level is reduced to the lowest possible level to make any problems visible on the production floor so that problems can be quickly corrected as measures designed to prevent the same problems from happening again. In other words, TPS fixes stock-related issues that may hide the seriousness of these issues while trying to quickly find out that issues are occurring to quickly resolve issues and take appropriate action to prevent further occurrence.

Toyota's idea is that, ignoring common sense about the size of mass production, it is better to produce the required quantity, even if it means reduced short-term productivity. This idea is maintained through scientific approaches such as measuring, analyzing, and rationalizing the production system. Many companies look for scale merit in the mass production of a single product. However, TPS instead aims to reduce the inventory level and lead time as much as possible in small lot production, even if it leads to an increase in the number of setup changes.

Most companies use a push production system in which the number of raw materials to be fed in the first process is determined according to the estimated sales volume. In contrast, TPS is a pull production system in which a production instruction (using Kanban) is given from the final process to the previous processes to ensure that the required amount of product is produced in accordance with the actual demand. While the stocking production system tries to "sell the manufactured goods", TPS tries to "produce the products sold". In the case of continuous production involving the conveyor belt, the entire operation is divided into a series of simple jobs, each of which can be carried out by a single skilled worker. However, such simple tasks increase a sense of distress, often leading to low morale. With TPS, employees are encouraged to develop multiple skills.

CHAPTER 5

5. KANBAN

5.1. WHAT IS KANBAN?

It can be described as a control tool that is formed by the combination of the words KAN which means Card in Japanese and BAN which means signal and helps to regulate the flow of information and materials in processes.

Kanban is one of the Lean Manufacturing techniques and is a visual method used to manage production.

In order to understand the Kanban system, the concept of just-in-time production must first be understood.

5.2. JUST IN TIME (JIT)

Just in time production system; It is named with qualifications such as stockless

production, production with minimum stock. Taichi Ohno, the first practitioner of JIT, made operational disruptions noticeable by reducing material flow inside the factory. Zero stock is an extremely successful method of making the production system transparent. With zero stock, the storage problem will be eliminated and wasteful process flows will arise, creating the necessary conditions for lean production.

Just in time production philosophy; It foresees having to reduce the inventory level at every stage of production in order to reach the zero stock target.

Waste is anything that does not add any value to the product, in an approach that relies on the constant elimination of waste to achieve excellence in a large manufacturing company.

With its narrower definition, JIT is the transportation of the necessary material to the required places when necessary. The Kanban system is the most suitable system for JIT in order to produce the desired amount of demand from internal and external customers when requested and requested.

In a just-in-time production system, the flow is reversed, with each station telling the previous one the most needed parts, the amount and the time it should have. Thus, only the desired part will be produced in the desired quality, time and number.

For example; If 1000 car left front doors are requested, only 1000 doors are produced. The 1001st door is not produced.

5.3. PUSH AND PULL SYSTEMS IN KANBAN

In order to understand the Kanban system, it is necessary to know the general lines of production systems. Production control systems; There are two types of systems as pulling systems and pushing systems.

- **Push systems** are systems based on classical planning logic, while pulling systems are just-in-time production systems without production planning or minimized. Production and inventory control in push systems is based on demand forecasts and has intermediate stocks. In the Kanban system, the minimum stock concept based on the calculated minimum number of boxes is valid.

PUSHING SYSTEM	PULLING SYSTEM
Production is guided by the future demand forecast.	Production is driven by current demand.
Changes in demand cause excessive and dead stock.	Changes in demand can be transferred from the next process to the previous one.
Safety stocks are created for possible errors.	There is no need for a safety stock as errors are prevented before they occur.
Inter-process information flow is fast	Inter-process information flow is slow.

A Kanban or card stating the delivered quantity is placed on top of the manufactured parts. When all parts are used, the same card returns to the first point where it was processed and creates the next request.

- Pull Systems: The basic structure of the system, also defined as the pull system; The next operation takes the amount and amount of material needed from the previous operation. The previous operation produces as much as the next operation pulls. In short, the request is made retrospectively from the final assembly.

5.4. PULL PRODUCTION

Where the continuity of the flow cannot be achieved, the process should be managed with controlled standard stocks and the flow should be tried to be ensured. For this, the pull system should be used instead of the push system in the current process.

The pull-type production method is a production control method that transmits the requirements of the customer process to the supplier processes via a signal. Pull-type production strives to eliminate overproduction and is one of the three main components of the Just-in-time production system.

In pull-type production, the next operation, whether in the same facility or in a separate facility, provides information to the previous operation about what material

or part is requested, the quantity required, and when and where it is required, often through a Kanban card. Nothing is produced by the supplier process until the customer process signals a need. This is the opposite of push generation.

In the drawing system, customers' expectations are immediately responded as the products are ready in the last process. Since the extracted products determine what the previous process will produce, the process continues without a plan. The response time to the customer is much shorter.

The major advantage of the pick system is the reduced inventory and therefore the associated cost inventory reduction.

In drawing systems, the end station transmits information about the final product demand to the previous station via the information flow production line.
Production cells or machines are aware of the direct demand from the end station.
Just in time production systems are systems that attract. Knowing which product will be produced when and in what quantity will only be known by the last process, which will enable this process to pull only the necessary parts from the previous processes.

On the other hand, production will not be made in the previous process without the part drawing of the next process, as a result, each process will produce just in time to meet the demands of the next processes.

In the drawing system, it is the tool used to transmit information to trigger the movement of the material or the start of production.

Kanban's are always in the opposite direction to the production flow, but they connect the production stages by moving from end to end together with physical units. Extending this chain to vendors outside of the business also ensures that there is no raw material stock. This system is also called progressing backwards.
The Kanban system uses simple cards to keep track of production. The simple logic here is that no workstation is allowed to produce products unless requested from the station that follows it, that is, each station is the customer of the previous station. This simple view prevents working with accumulated inventory. There is no need for a computer.

5.5.   APPLICATIONS AND BENEFITS OF KANBAN SYSTEMS

Benefits of the Kanban system;

- Reduces inventory and product in circulation. In this way, loss of capital and wasteful activities related to stocks are also reduced.
- Increases flexibility in terms of changing customer needs and expectations.

- It greatly simplifies production management. Kanban doesn't even need computer training systems. All we need is cards, effective time planning and discipline.
- It is a tool that ensures the coordination (synchronization) of processes with different flow rates with each other.
- It enables each process to pull what it needs from the previous process.
- It eliminates production planning.

Kanban System application consists of the following five steps:

1. Analysis and selection of processes
2. Defining Kanban rules
3. Selecting the Kanban type
4. Planning and sizing
5. Creation of organization tools and cards

Kanban cards are the best known and the most common example of implementation. Sometimes they are protected from wear with a clear plastic cover. Information such as part name, part number, external supplier or internal supplier process, packaging amount, storage location address and customer process address are included on the cards. A barcode can be printed on the card for tracking or automatic invoicing.

As well as cards, the Kanban can be triangular metal plates, colored balls, electronic signs or any other device, and they transfer the necessary information while preventing false information from entering the process. Regardless, Kanban has two functions in a manufacturing operation: they instruct processes to make the products, and they instruct materialists to transport the products. The first way of using is called the production kanban, the other using the pull kanban.

The most common problems with Kanban applications are:

- Early and early start of Kanban studies,
- Modification of Kanban principles and hybrid applications
- Employees see the Kanban system as simple as it won't work
- Establishing systems without good thought
- The Kanban activity is not checked regularly and the thought will work the same forever
- Kanban system cannot reduce stocks bias
- Mourning when problems arise and a tendency to go back to old times

5.6.   KANBAN TYPES

Two types of basic Kanban are used in just-in-time production system implementation, one is Pull Kanban and the other is production order Kanban.

- **Pull Kanban;**

  The Pull Kanban is a rectangular card used in the Toyota production system that specifies the type and quantity of the part that the next production station wants to pull from the previous station and is used to pull them. With the Drawing Kanban in the example, it is stated that the previous operation for the part in question is forging and that the carriage in machining must go to the forging station to receive the drive pin. Also, the next operation for the part in question is machining. The box capacity is 20 pieces and the box shape is indicated as B.

Stok Raf No: 5E215 Parça Arka No:A2.15			Önceki Operasyon
Parça No : 356 70 S 07 Parça Adı : Tahrik Pimi Araba Tipi : Sx50 BC			Dövme B-2
			Sonraki Operasyon
Kutu Kapasitesi	Kutu Tipi	Sayı	Talaşlı İmalat M-6
20	B	4/8	

- **Production / Order Kanban;**

  In the Toyota production system, this Kanban indicates the type and quantity of parts that the previous production station had to produce. This Kanban is also called the production Kanban.

  The production Kanban tells the previous process the type and quantity of products it has to make for the next process. In the simplest case, a single card corresponds to a cash piece that the previous process would do and then put in the supermarket in between.

  The production order Kanban given in the figure; It shows that the Machining operation No SB-8 will produce crankshaft for the car type S X 50BC - 150. It is also stated that the crankshaft will be placed in the stock rack No. F26 - 18.

Stok Raf: F26-18	Parça Arka No: A5-34	Operasyon
Parça No	356 70 s 07	Talaşlı İmalat
Parça Adı	Tahrik Pimi	
Araba Tipi	SX50BC-150	

- **Supplier Kanban;**

  This Kanban is used to pull parts produced to suppliers, a card that orders the supplier when and where to ship the required parts. That is, it is a kind of pull Kanban that includes instructions on the delivery of parts to be procured from outside.

- **Special Kanban;**

  It is a type of Kanban prepared for order production and distributed and collected for each order.

- **Urgent Need Kanban;**

  They are Kanban that are temporarily distributed due to demand changes, erroneous transaction and subsequent additions, and withdrawn when the job ends.

- **Signal Kanban / Sign Kanban;**

  The Signal Kanban, which is used in the production areas where batch production is made, is usually attached to one of the boxes in the lot and its location indicates the ordering point.

  When the signal comes to the box where the Kanban is attached during production, the production order for that lot must be issued. Signal Kanban; It has two types; one is rectangular shaped Material Request Kanban and the other is triangle shaped Triangle Kanban.

- **Triangle Kanban;**

  This triangular Kanban is used to give production orders to the drilling process in automobile factories that apply the lean production system.

- **Material-Request Kanban;**

  It is used for material requirement in batch production. This rectangular card determines when, in what quantity and from where they will supply the material to their production process.

Although Kanban applications are simple, easy to understand, easily implemented, and do not cause additional costs, many problems are encountered in practice.

5.7. KANBAN RULES

Kanbanların Tam Zamanında Üretim amacıyla kullanılabilmesi için aşağıda belirtilen kurallara uyulması gereklidir.

In order for Kanban to be used for Just in Time Production, the following rules must be followed.

Rule 1: The next production process must pull the required parts from the previous process in the required quantities and at the required time.

In order for this rule to be implemented, top management must decide to change the previous direction of production, transportation and delivery flows, and this is a highly critical decision.

In order for this rule to be applied, the following rules must also be applied together.
- Balancing of production speed over time
- Revision of layout plans for processes
- Standardization of production methods must be carried out.

Rule 2: The previous production process has to produce the amount drawn by the next process.

When Kanban rules 1 and 2 are met, all production processes will be unified like a conveyor line. If there is a problem in any of the production processes, the entire line may be stopped, but the balance between the processes will be restored.

In order for rule 2 to be applied, the following rules must be applied together:
- Producing more than the number of Kanbans should not be allowed.
- If different parts were produced in the previous process, their production should be made in accordance with the arrival order of Kanban.

Rule 3: Defective parts should never be passed on to the next manufacturing process. If this rule is not followed, the Kanban system will cease to function.

In the Just In Time Production environment, the interruption of production will be immediately noticed by the workers on the line, and the fact that faulty production attracts such attention will play an important role in preventing the repetition of errors. The standardization of production operations is one of the important conditions of the Kanban system, as faulty operations will also cause the production of defective parts.

Rule 4: The number of Kanban should be minimized.

Since the total number of Kanban determines the level of in-process inventory within the system, the goal is to keep this total number as low as possible.

Continuing efforts to make continuous improvements to production processes will help enforce Rule 4 and at the point where Rule 4 is implemented, in-process inventories will be reset. In environments where flexibility cannot be achieved, it is possible to adapt to increases in demand by increasing the total number of Kanban or the level of security stock.

If demand decreases, the standard operations cycle time will need to be increased. However, the number of workers in the production line will also be reduced in order to prevent the idle time that will arise in this case.

Rule 5: Kanban should be used to adjust the production rate in response to small fluctuations in demand.

With Kanban adjustment of production speed against fluctuations in demand is one of the most important features of this system. In environments where the Kanban system is used, production schedules are only sent to the final production stage, and all other stations learn what they will produce by leaving the production order Kanban from the container. Kanban is the tool used to transfer the changes to the previous processes instantly.

CHAPTER 6

6.   LEAN

6.1.   WHAT IS LEAN?

In Lean, the main idea is to maximize value to customer while minimizing waste. In simple terms, Lean means creating more value for customers with fewer resources. Lean is an improvement and problem solving methodology that strives to reduce or eliminate activities that don't add value to the customer. Management guru Peter Drucker said, "There's nothing so useless as doing efficiently that which should not be done at all."

Lean is a philosophical way of working which emphasizes the removal of waste within a process. Core to this philosophy involves the principle that expenditure of resources for any goal other than the creation of value for the end customer is wasteful and therefore should be a target for elimination. This principle is applied from the perspective of the customer who uses a product or service.

Value is commonly defined as any action or process that a customer would be willing to pay for. Simply, Lean Process focuses on preserving value with less work. Therefore, the aim is to provide improved efficiency that results in improved process flow and increased speed throughout a process. Lean philosophies achieve this through applying a series of "tools" which assist in the identification and steady elimination of waste. As waste is eliminated, production time and costs are reduced and quality increases. A lean process emphasizes getting the right things at the right time, in the right amount, to the right place to achieve the perfect, sustainable workflow while minimizing waste and easily adapting to change.

A lean organization understands customer value and focuses its key processes to continuously increase it. The ultimate goal is to provide perfect value to the customer through a perfect value creation process that has zero waste. Eliminating waste along entire value streams, creates processes that require less human effort, less space, less capital and less time to make products and services with less cost and less defects compared to traditional systems.

In summary, the Lean methodology relies on 3 very simple ideas:

- Deliver value from your customer's perspective,
- Eliminate waste (things that don't bring value to the end product)
- Continuous improvement.

6.2.   THE BIRTH OF LEAN

The lean thinking system started to develop at the Toyota manufacturing plant in Japan in the mid-twentieth century. The lean management system, which caused a breakthrough in the industry with its technique and philosophy, was realized in the west in the 1980s. The biggest contribution of the lean management system, also known as Toyota production system(TPS), to the industrial world is to produce everything in line with the customer's request and demand and to create a philosophy of eliminating unnecessary stocks completely. Stock is considered a waste in the system. One of the system's major innovations is that workers were seen as problem solvers who are trained and empowered to improve their processes and eliminate waste.

After World War II, Japanese factory owners adopted a number of American manufacturing and quality techniques, and Toyota was one of them. Henry Ford's manufacturing techniques and Edwards Deming's Statistical Quality Control ideas became the foundation of Toyota's manufacturing process. Unlike the American automotive industry, Toyota encouraged its employees to be part of the manufacturing process. The company introduced quality circles, a group of workers who came together to discuss workplace improvement. Quality circle members make presentations to management on production quality. Toyota has developed a set of procedures that reduce the time required for setup and changeovers.

The developments made by Toyota were adopted by other Japanese manufacturers but none were as successful. In the 1980s, American companies began to adopt some of the processes developed by Toyota and gave these names such as Just In Time Production (JIT), Continuous Flow Manufacturing (CFM), World Class Manufacturing (WCM), and Stockless Production.

Lean maintains its dominance in manufacturing and also helps businesses across all industries eliminate waste, improve processes and increase innovation in new applications.

6.3.   GUIDING CONCEPTS IN LEAN MANAGEMENT

Two guiding concepts are the heart of the Lean methodology. These are respect for people and continuous improvement. An organization can not practice Lean without embracing them both.

1. **Respect for People:** Lean thinkers recognize that the best ideas often come from people who are directly responsible for producing the product or providing the services. They turn top-down management on its head and give those who are closest to the product or the customer to have an equal voice. One basic Lean practice involves managers going to the "gemba" or the place where the work

gets done to see workspace conditions and process activities first hand, giving front-line workers the opportunity to share insights and answer questions. This process often results in opportunities to improve.

2. **Continuous Improvement:** Lean leaders believe that processes can always be improved and that improvement is a daily activity that is the responsibility of everyone in the organization. Structure is applied with an improvement cycle such as PDSA (Plan, Do, Study, Act) or DMAIC (Define, Measure, Analyze, Improve, Control.) Often continuous improvement software is used to organize, measure, and report on Lean activities.

6.4.   BASIC PRINCIPLES OF LEAN MANAGEMENT

The five principles are considered a recipe for improving workplace efficiency and include: 1) defining value, 2) mapping the value stream, 3) creating flow, 4) using a pull system, and 5) pursuing perfection. The next sections provides a detailed overview of each principle. As can be seen in the figure below, there is a link between the basic principles of lean management understanding. Businesses that adopt and want to implement a lean management approach should apply all of these principles together.
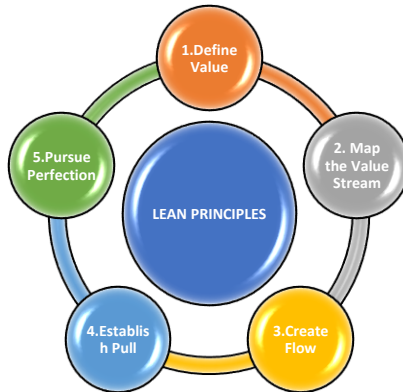
The Five Lean Principles

1. **Define Value:** To better understand the first principle of defining customer value, it is important to understand what value is. Value is what the customer is willing to pay for. It is paramount to discover the actual or latent needs of the customer. Sometimes customers may not know what they want or are unable to articulate it. This is especially common when it comes to novel products or technologies. There are many techniques such as interviews, surveys, demographic information, and web analytics that can help you decipher and discover what

customers find valuable. By using these techniques you can uncover what customers want, how they want the product or service to be delivered, and the price that they can afford. All value is defined by the customer, not the producer. The organization then focus on eliminating waste so that they can deliver what the customer wants with the highest possible margins.

2. **Map The Value Stream:** The value stream represents the sum of the product's entire life-cycle from research and development through to the customer's use of the product. A deep understanding of the value stream is necessary to achieve maximum value and eliminate waste. Every process is examined to see what value it adds. Processes, features, and materials that don't add value are removed. In this step, the goal is to use the customer's value as a reference point and identify all the activities that contribute to these values. Activities that do not add value to the end customer are considered waste.

3. **Create Flow:** After removing the wastes from the value stream, the following action is to ensure that the flow of the remaining steps run smoothly without interruptions or delays. The value stream should flow seamlessly without interruption or delay. The Lean method seeks to have every process entirely in sync with every other. A smooth process flow is one of the conditions necessary for just-in-time production.

4. **Establish Pull:** What makes flow possible is the idea of pull. In Lean, pull means ensuring that nothing is made before it is needed. Inventory is considered one of the biggest wastes in any production system. The goal of a pull-based system is to limit inventory and work in process (WIP) items while ensuring that the requisite materials and information are available for a smooth flow of work. In other words, a pull-based system allows for Just-in-time delivery and manufacturing where products are created at the time that they are needed and in just the quantities needed.

5. **Pursue Perfection:** In line with the guiding concept of continuous improvement, Lean practitioners exercise a relentless pursuit of perfection. Wastes are prevented through the achievement of the first four steps. However, the fifth step of pursuing perfection is the most important among them all. It makes Lean thinking and continuous process improvement a part of the organizational culture. Every employee should strive towards perfection while delivering products based on the customer needs. The company should be a learning organization and always find ways to get a little better each and every day.
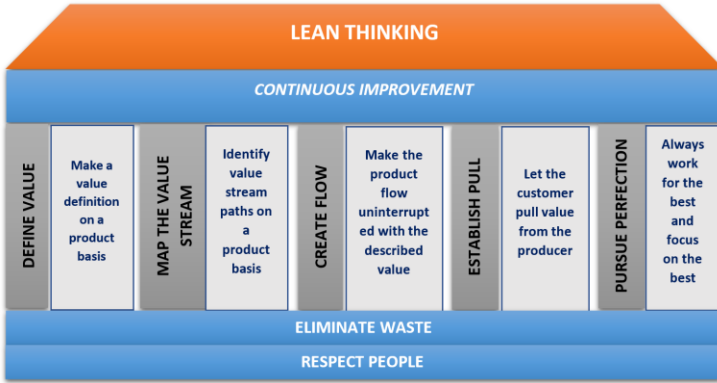
The Lean Thinking

In summary, Lean thinking refers to a comprehensive strategic structure that aims to make continuous improvement, free from waste, and that ensures the creation of an organizational structure and culture that respects employees. Value, value stream, flow principle (value), pull principle and perfection principle are the basic steps in lean thinking. Businesses that want to adopt a lean thinking system should first determine the value of a product and define a value, then determine the value stream maps, then ensure that the stream through these maps is continuous and finally the perfection principle should be perceived well in order to produce the product according to the customer's request and finally to always do the best.

6.5.   THE EIGHT WASTE OF LEAN

The principles relating to the eight wastes of Lean involve the optimal utilization of process resources and/ or activities. These were originally developed by Toyota's Chief Engineer, Taiichi Ohno, as part of the Toyota Production System (TPS) and have been successfully applied within both manufacturing and services environments. These eight wastes of Lean are described as follows:

1. **Overproduction:** Involves the principle whereby more resources than required to be delivered to your customer are expended. Overproduction is considered to be a particularly bad form of waste because it contributes to many of the others, especially excessive inventory. Overproduction is an insidious waste because it contributes to many of the other wastes including inventory, motion, and transportation. The antidote is to produce only what is needed when it is required.

2. **Unnecessary Transportation:** Involves the principle whereby each time a product is moved, it stands the risk of being damaged, lost, delayed, etc., as well as being a cost for no added value. Lean leaders consider transportation a waste when materials are moved from one place to another in a way that does not add value for the customer.

3. **Excessive Inventory:** It is the principle whereby inventory, in any of its stages of use, represents a capital outlay that has not yet produced an income, either by the manufacturer or for the consumer. Inventory not being actively processed to add value is considered waste. Inventory of products or materials that is not immediately needed to fulfill customer needs is targeted for elimination. Too much stock creates waste in terms of storage, management, and loss of value over time.

4. **Excessive Motion:** As compared to Transportation, involves the principle whereby motion is considered in the context of the producer, worker or equipment. Excessive motion contributes towards increased risks of damage, wear and safety. It also extends to fixed assets and expenses incurred in the production process. The waste of motion occurs when movements of people, materials, or machines are more complicated or occur more frequently than necessary.

5. **Defects**: Involves the principle whereby process defects result in additional costs ultimately being incurred in areas such as rework, repair, re-processing, rescheduling production, etc. Quality errors are a blatant waste of materials, time, and human effort.

6. **Over-processing:** Involves the principle whereby over-processing is considered to occur any time more work is performed upon a good or service than what is required by the customer. This includes using tools, materials and/or systems that are more precise, complex, excessive, or expensive than absolutely required.Over-processing means putting more work, features, or cost into the product than the customer values. Lean leaders look to produce what is necessary and no more.

7. **Waiting:** Involves the principle whereby whenever goods are not in transport or being processed, they are waiting. This principle is also applied to workers who are waiting for something in order to perform a process or activity, etc. The waste of waiting occurs when processes become out of sync and flow is interrupted. Waiting is a costly inefficiency.

8. **Human Potential:** The waste of human potential occurs when a person's skills, capabilities, and ideas are underutilized. It is perhaps the most challenging waste to recognize, but arguably the most damaging.

The 5S method used to reduce waste:

The 5S method is the initiator of every improvement program. It is a tool that helps the analysis of workplace processes. 5S is a well-organized, clean, high-impact and quality workplace creation and maintenance methodology. When 5S is implemented properly, it can identify and reduce many forms of waste in any process or workstation. An organized work area reduces excessive motion and wasted time looking for the right tool. The visual aspect of the 5S methodology is also very effective. When everything has a place, waste in the form of looking for tools or supplies is eliminated. Improved visual controls are implemented as part of 5S to make any process non-conformances obvious and easily detectable.

The result is the efficient organization of the workplace, the reduction of the working environment, the elimination of losses associated with failures and breakdowns, and the improvement of the quality and safety of the work. The origins of 5S's philosophy are in Japan. 5S derives its name from the abbreviation of the following five Japanese words.

- **Seiri - Sort:** Separating the essential from the nonessential items.
- **Seiton - Set in Order:** Organizing the essential materials, everything has its place
- **Seiso - Shine:** Cleaning the work area
- **Seiketsu - Standardize:** Establishing a system to maintain and make 5S a habit
- **Shitsuke - Sustain:** Establishing a safe and sanitary work environment.

6.6.   WHY IMPLEMENT LEAN?

Organizations today must do more with less. Many companies are continually looking for ways to become more competitive in the marketplace. Every new product idea must have a solid business case to back it up. Otherwise, management would not allow that project to continue. On several occasions, the fate of a project has rested upon cost versus market value. Lean is all about adding value to the product while eliminating waste.   In order to assure long-term survival in today's economy, organizations must continually reduce waste.

When implemented properly, Lean enables companies to be more adaptable to market changes. With the implementation of lean management, companies will benefit from creating streamlined processes, less waste, and lower operational costs. They will also create a culture of continuous improvement. And by doing so, they will ensure the long-term survival of the company in today's fast-paced economy.

CHAPTER 7

7.   SIX SIGMA

7.1.   WHAT IS SIX SIGMA?

The Six Sigma method is a project-oriented management approach to improve the products, services, and processes of the organization by continuously reducing the defects in the organization. It is "the business strategy used to increase the efficiency and productivity of all operations to increase business profitability, meet or exceed customer needs and expectations" in the business world and is an information-based methodology to increase customer satisfaction and improve processes by focusing on financially measurable results.

An alternative definition used in Motorola is with a different point of view: It is the philosophy of guiding behavior by making the values of an organization clear in the wage system and by revealing a business strategy to reduce costs and increase customer satisfaction.

The Six Sigma approach was first applied in production activities and quickly spread to different functional areas such as marketing, engineering, purchasing, service, and administrative support after companies realized its benefits. In particular, the widespread application of six sigma has been made possible by the ability of organizations to express the benefits of six sigma in financial returns by relating process improvement to cost savings. It is a business strategy that focuses on understanding customer needs, improving business systems, productivity, and financial performance. Six Sigma focuses critically on output that is important to customers. It focuses on the root causes of business processes / problems to reduce variation (spread) around the mean value of process data.

It would be a mistake to think of Six Sigma as quality in the traditional sense. Quality, traditionally defined as compliance with internal requirements, has little to do with Six Sigma. Six Sigma is all about helping the organization earn more money. A new definition of quality is required to relate this goal of Six Sigma to quality. Quality comes in two flavors: potential quality and real quality. Potential quality is the maximum known value that can be added per unit of input. Actual quality is the current value added per input unit. It is the difference between potential and actual quality.

The term "Six Sigma" refers to a statistical measure of the failure rate within a system. This method, supported by statistical techniques, aims to reduce the error rate by offering a structured and systematic approach to process improvement. To illustrate the meaning of Six Sigma failure rates in a system, Pande and the others (2000) provide some useful examples of the difference between 99 percent quality and

superior rate of six sigma quality in several different situations. For example, while 3,000 wrong deliveries will occur for every 300,000 letters delivered at the post office that is working at 99 percent quality standards, there will be just one wrong delivery if it operates at the Six Sigma level.

The basis for the effectiveness of six sigma is the prudent application of statistical techniques for information gathering, analysis, and interpretation. Six sigma turns an operational problem into a statistical problem, uses proven mathematical tools to solve it, and turns the results back into practical actions. Sigma, σ, is a letter in the Greek alphabet that statisticians use to measure variability in any process. The performance of a company is measured by the sigma level of its business processes.

A very strong feature of Six Sigma is the creation of an infrastructure that will ensure that performance improvement activities have the necessary resources. According to this author, failure to provide this infrastructure is the # 1 reason why 80% of TQM applications have failed in the past. Six Sigma improves and replaces the full-time job of a small but critical percentage of organizational staff. Six Sigma has been integrated into the DMAIC framework, including statistical methodologies such as quality management and quality function distribution, failure mode and impact analysis, design of experiments, robust design, defect protection and statistical process control, greatly facilitating the understanding, learning and deployment of practitioners.

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control, greatly facilitating the understanding, learning and deployment of practitioners.

Six Sigma focuses on improving quality (i.e. reducing waste) by helping organizations produce better, faster and cheaper products and services. Six Sigma focuses on defect prevention, cycle time reduction and cost savings in the more traditional sense. Unlike mindless cost reduction programs that reduce value and quality, Six Sigma identifies and eliminates costs that do not value customers and evaluates costs. It is a meticulous, focused and highly effective application of proven quality principles and techniques. Six Sigma, which brings together elements from the works of many quality pioneers, aims for an almost error-free business performance. Six Sigma involves changing the major streams of business value that cross corporate barriers. They are ways to achieve the strategic goals of the organization. This effort cannot be managed by anyone except the CEO, who is responsible for the performance of the organization as a whole.

7.3.   SIX SIGMA METHODS

Six Sigma brings the structure to process improvement by providing the user with a more detailed summary of Deming's plan-do-control-process cycle by guiding the initiative through a five-step identification-measurement-analysis-improvement-control cycle (DMAIC) cycle. Each stage includes a set of related tools and techniques, such as statistical process control, experimental design, and response level methodology, which provide a comprehensive technical toolbox to measure, analyze and improve critical processes to control the system.

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Training of key personnel is critical to effectively tracking the DMAIC cycle and achieving significant results. These trainings are carried out with the participation of senior management in case the initiative takes root. The management should play an active role in the selection of projects on which the newly trained Six Sigma team will focus and ensure that all necessary resources are available. Based on this, before embarking on the Six Sigma journey, the roles required for implementation should be specifically defined and clearly stated within the organization; so everyone involved knows their responsibilities, exactly what needs to be done and in what order. It is essential that Six Sigma is understood as both a philosophy and a scientific approach, and that this understanding is increasingly accepted.

The purpose of applying Six Sigma in R&D organizations is to reduce costs, increase the speed to the market and improve R&D processes. Organizations need to focus on data-based reviews, improved project success rate, and integration of R&D into streamlined business processes to measure the effectiveness of six sigma. One survey found that as of 2003, only 37% of respondents officially applied the Six Sigma principle in R&D organizations. The Six Sigma principle and the healthcare industry are well aligned due to the potential for zero tolerance for errors and reduction of medical errors. Some of the successfully implemented six sigma projects include improving timely and accurate compensation payments, streamlining the process of healthcare delivery, and reducing the inventory of surgical equipment and associated costs.

Johnson and Swisher (2003) provided useful application tips for the success of six sigma practice:

• Sustainable and visible management commitment.
• Continuing training and training of managers and participants
• Set clear expectations and carefully select project leaders for leadership skills.
• Selection and selection of strategically important projects.

The Six Sigma project must be carefully studied, planned, and selected to maximize the benefits of implementation. The project should be feasible, organizationally, and financially useful, and customer focused. There must be a clear set of measures and measurements to meet customer requirements. The status of the project and the performance of the six sigma tools and techniques being applied should be reviewed periodically. The project should be well documented to follow project constraints, especially cost, schedule, and scope. There should also be a learned lesson mechanism to address the key issues of previous projects.

Organizations should realize that Six Sigma is not a universal answer to all business problems and is not the most important management strategy that an organization feels urgent to understand and implement. To ensure the long-term sustainability of the Six Sigma method, organizations need to analyze and acknowledge their strengths and weaknesses and use the Six Sigma principle, concept and tools correctly. Before the challenges faced by people facing cultural change and the implementation of six sigma, it is necessary to understand what the change is. This requires a clear communication plan and channels, motivating individuals to break through resistance, and educating senior managers, employees, and customers about the benefits of six sigma. Announcing the results of the Six Sigma project, including successes, obstacles, and challenges, will help future projects avoid similar mistakes and adopt only best practices.

7.4.   SIX SIGMA STAFF

Training is a key success factor in the successful implementation of Six Sigma projects and should be part of an integrated approach. Generation program should start from the beginning and be applied to the whole organization. The curriculum of the generation program should reflect the needs and requirements of the organization. It should be customized to include economic and managerial benefits. Training should also cover both qualitative and quantitative measures and metrics, leadership and project management practices and skills. It is important to note that formal education is part of the development plan to produce different generation level professionals.

Participants should be well informed about six sigma's latest trends, tools and techniques and communicate with real data analysis. Education and training make clear sense for people to better understand the basics, tools, and techniques of six sigma. Training is part of the communication techniques that enable managers and employees to effectively apply and apply complex six sigma techniques.

Generally, there is a specialization ranking determined by the generation system. Four different generation levels (Master, Black, Green, Yellow) allow the Six Sigma project to be set up and run smoothly. The characteristic of the Six Sigma company is that it has a high-profile group of employees known as Blackbelt (Black Belt). (Most companies also have Master Belts and Green Belts.) Black Belt devotes much of its time to leading process improvement projects. Usually, this training has four weeks duration: it can consist of two-week courses or 4 courses a week, or shorter courses in succession. In most cases, the Black Belt does not qualify until completing the training and successfully completes one or two projects. Candidates for black belt status are technically oriented people.

It should be actively involved in the organizational change and development process. Candidates can come from a wide variety of disciplines and are not necessarily officially trained statisticians or engineers. However, as they are expected to master a wide variety of technical tools in a relatively short time, Black belt candidates will likely have a background in college-level mathematics, which is the main tool of quantitative analysis. Green Belts is a Six Sigma project leader with the ability to create and facilitate Six Sigma teams and manage Six Sigma projects from concept to completion. Green belt training consists of five days of classroom training and is carried out in conjunction with Six Sigma projects. The training covers project management, quality management tools, quality control tools, problem solving, and descriptive data analysis. Master Black Belts are the technical leaders of Six Sigma. They act as instructors for both Black Belt and Green Belt and provide continuous coaching and support to project teams to ensure that their statistical practices are appropriate. They provide strategic and operational support to the project. Originating in martial arts, the term "black belt" is absolutely new in the business context. Of course, there have always been people motivated to improve processes, but few achieved the level of success reported in the promotion.

In some of the Six Sigma companies, the performance appraisal system is designed to encourage middle management's commitment to the success of black belt projects. However, the company will only benefit from this advantage if the goals of the middle management are in line with the company's vision, values, and goals. It is therefore not surprising that the senior management team has published a meaningful vision and value across the company and used them to create specific, meaningful, understood, realistic and time-based goals at all levels. Distribution of goals is not a trivial task. It is not easy to set goals for low-level people so that their resulting behavior fully contributes to the achievement of high-level goals. Many senior management teams had set an inspiring vision and invaluable high-level goals, but then struggled to implement them effectively at lower levels.

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7.5.   SIX SIGMA SUCCESSES

Steps required to successfully implement Six Sigma:

- Successful performance development should start with top leadership. Start by giving senior managers training on the principles and tools needed to prepare their organizations for success. Senior leaders direct the development of a management infrastructure to support Six Sigma using their newly acquired knowledge. At the same time, steps are being taken to make the organization "soft-wired" and to create an environment for innovation and creativity. This includes lowering the levels of the organizational hierarchy, removing procedural barriers to experimentation and change, and various other changes designed to make it easier to try new things without fear of retaliation.

- Systems have been developed to communicate closely with customers, employees, and suppliers. This includes developing rigorous methods to capture and evaluate customer, employee, and supplier inputs. Baseline studies are carried out to identify the point of success and identify cultural, policy and procedural barriers to success.

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Over the past few years, there has been increasing organizational interest in successful implementation and the Six Sigma method. Factors influencing a successful six sigma project include management involvement and organizational commitment, project management and control skills, cultural change, and continuing education. Understanding the key features, barriers, and shortcomings of six sigma provides practitioners an opportunity to better implement the Six Sigma project. It enables them to better support the strategic direction of their institutions and increase their coaching, mentoring, and training needs.

Six Sigma will continue to remain one of the key initiatives to improve the management process. These initiatives should focus primarily on improving overall management performance, not just detecting, and counting defects. The statistical aspects of Six Sigma must complement the business perspectives and challenges faced by the business to successfully implement the Six Sigma project. Integrating the data-driven, structured six sigma process into organizations still has areas for improvement. Cultural changes take time and commitment before they can be strongly embedded in the organization. Effective Six Sigma principles and practices are more likely to succeed by constantly defining the organizational culture. Six Sigma has long been viewed as a statistically intensive, technical approach to process control. To prevent improvement approaches from becoming a new "myopic revolution", we must learn from our past mistakes and ensure that the broader philosophy behind Six Sigma's structured technical features is recognized and acknowledged.

CHAPTER 8

8.   SCRUM

8.1.   WHAT IS SCRUM?

Nowadays, it is almost impossible to stay away from Scrum dealing with project management in any sector. As the projects grew and became complex over time, the easy adaptation and speed expected from the projects brought with it the question of classical approaches.

In the 90s, many important IT projects failed despite huge budgets, professional and competent teams, and outstanding efforts. The competitive conditions of the business world required all organizations, especially software, to quickly launch the products they developed, and also to respond quickly to changing needs. The formation of the Agile Project Management concept is exactly the answer to these needs.

The Agile Software Development Manifesto is structured on four core values.

• People and interactions take precedence over processes and tools.
• Working on the software takes precedence over working on the document.
 • Collaboration with the customer takes precedence over the contract concluded with the customer.
 • The response to change takes precedence over adhering to a plan.

Scrum is one of the agile project management methodologies developed to apply these core values to the project. Jeff Sutherland describes this new approach they developed with Ken Schwaber in his book 'SCRUM: The Art of Doing Twice the Work in Half the Time' as 'the new method that can deliver more things with less people, less time, higher quality and at lower cost'.

Although the boldness of the promises raise doubts, Scrum is a revolution in project management when its foundations, suitability to human psychology, way of working and most importantly its achievements are examined. Moreover, it is also promising for a better world in that it provides fast and successful results from projects in areas such as education, health, and government administration.

Reasonably, the emergence of Scrum does not happen all of a sudden. The approach itself is inspired by many studies and examples. "When I designed Scrum, I looked at what super performing teams did and what others couldn't," says Jeff Sutherland. "I wondered why, why some teams are changing the world but others are stuck with mediocrity".

Especially the articles of Hirotaka Takeuchi and Ikujiro Nonaka named "The New New Product Development Game'' published in Harvard Business Review in 1986 have an important role in the creation of Scrum. Examining teams at some of the world's most productive and innovative companies, Japanese professors described in this article that old product development models were flawed, and described successful teams as cross-functional, autonomous, and priority goals. Moreover; They compared what the teams did with the functioning of a rugby team and stated that the best team acts together like in a Scrum. 'We call this approach SCRUM - the head-to-head position of the strikers when the Scrumdown decision was made ... '

As a result of all their research and observations, Ken Schwaber and Jeff Sutherland developed Scrum on the basis of "empirical process control theory'' in the early 1990s. "Every empirical process control application in Scrum is supported in three pillars: transparency, control and adaptation."

 • **Transparency:** The progress and problems of the project are accessible and viewable by everyone.

• **Inspection**: It should be evaluated at regular intervals together with the parts of the project.

• **Adaptation:** Unlike classical project management methods, the needs and progress of the project are not determined in an unchangeable form from the outset. On the contrary, it is constantly evaluated in the process and adaptations are made according to the situation.

8.2.   SCRUM ROLES

By; We have stated that Hirotaka Takeuchi and Ikujiro Nonaka define "successful teams as cross-functional, autonomous and with a sense of purpose". Ken Schwaber and Jeff Sutherland, who embraced this idea, further elaborated the concept of teams. They determined the roles within the team as Product Owner, Development Team and Scrum Master.

• **Product Owner**

The Product Owner is responsible for maximizing the work of the Development Team and the value of the product. The Product Owner is the person who is solely responsible for managing the Product Backlog. The Product Owner determines which features and functions the product will have and decides in what order they will be implemented. Acting in line with the determined product vision, it provides the necessary communication for the whole team to act in accordance with the vision. It communicates with customers and stakeholders and receives the necessary information from them and keeps the Product Backlog updated with this information. Anyone who wants to make changes to the Product Backlog must contact the Product

Owner. For the Product Owner to be successful, it is of utmost importance that her decisions to be respected by everyone in the organization.

• Development Team

It is a cross-functional, self-managed team consisting of people who have the knowledge and experience to design the product. The members are collectively responsible for delivering a 'Done' product at the end of each Sprint and for delivering a publishable part. Each of the team members can only have the title of 'developer'. The size of the team is defined as 3 to 9 in the Scrum Guide. 'The optimal Development Team size should be small enough to act quickly and large enough to complete meaningful work in a Sprint. Fewer than three team members reduce interaction and limit productivity gains. Small teams may encounter skill constraints throughout the Sprint, potentially failing to deliver a publishable Increment. A team with more than nine members, on the other hand, needs a lot of coordination. Large Development Teams cause more complexity than can be managed in an experimental process. "(8)

• Scrum Master

The Scrum Master is responsible for ensuring that Scrum is understood and implemented; she is a "servant leader" for the Scrum Team. By applying Scrumu, it supports the product owner and the development team. She serves the team by removing impediments and organizing deviations in the process.

8.3.   SCRUM EVENTS

Jeff Sutherland and Ken Schwaber determined the roles as well as detailed how these roles would be implemented with examples. They defined the Scrum Events that should be implemented fully. In this way, they aimed to prevent unnecessary meetings which decrease productivity.

• Sprint

The Sprint is the heart of the Scrum, with a time limit of a month or less, in which a usable and potentially publishable Increment is created in the state of "Done". One from start to finish Sprints have a fixed duration during development work. As soon as the previous Sprint ends, the new Sprint starts. A sprint can only be canceled by the Product Owner when reaching the sprint goal no longer makes sense. But sprint cancellation is wasteful and tiring for the Scrum Team. Therefore, there are very rare sprint cancellations.

• Sprint Planning

The first thing to do in a Sprint should be to organize a Sprint Planning meeting. The Development Team, Scrum Master and Product Owner do the planning together. The duration of a Sprint Planning meeting is a maximum of 8 hours for a 1-month Sprint. The meeting consists of two parts. In the first part, the Scrum team discusses what can be done in this Sprint. The Development Team decides which jobs will be included in the Sprint from the Product Backlog. After the Development Team plans the Product Backlog items to be delivered in the Sprint, the Scrum Team creates the Sprint Goal. The subject of the second part is how to do the determined work. In the first part, the Product Backlog was converted to the Sprint Backlog. The work planned now is expressed in more detail and broken down into smaller pieces.

• Daily Scrum

These are the meetings not exceeding 15 minutes, in which the Scrum team, which comes together at the same time and at the same place every day, creates a plan for the next 24 hours. The Development Team answers the following 3 questions.
- What did I do yesterday to get the Development Team to reach the Sprint Goal?
- What will I do today for the Development Team to reach the Sprint Goal?
- Is there an obstacle preventing me or the Development Team from achieving the Sprint Goal?

Jeff Sutherland defines the daily Scrum meetings as 'Scrum's heartbeat'.

• Sprint Review

Sprint Review is the meeting where the committed work and Increments are checked with an aim to assess whether they are performed accordingly. At the end of each Sprint, the Scrum Team and stakeholders evaluate the work done in the Sprint at this meeting; They collaborate to determine what can be done to maximize its value. The duration of this meeting is limited to 4 hours for a one-month Sprint. The output of the Sprint Review is an updated Product Backlog containing the items that can be selected for the next Sprint.

• Sprint Retrospective

Sprint Retrospective meeting is held after the Sprint Review meeting. It allows the Scrum Team to observe its work and commitment throughout the Sprint and provides a space for further improvements for the next Sprint. It's limited to a maximum of 3 hours for a one-month long Sprint.

8.4.   SCRUM ARTIFACTS

We have basically summarized the concept of Scrum based on with whom and how to be apply by the descriptions of its creators, Jeff Sutherland and Ken Schwaber. In terms of clarifying the whole method, it is useful to briefly mention the Artifacts of Scrum.

- **Product Backlog**

The Product Backlog is where everything that is needed in the product is listed; the list for which the Product Owner is responsible for its content, availability and ranking. 'The Product Backlog is dynamic; it constantly changes to determine what the product needs to be useful, competitive and beneficial ''. Refinement of the Product Backlog is the act of adding detail, forecast, and sequence attributes to items in the Product Backlog.

- **Tracking Progress Toward a Goal**

 The Product Owner tracks the total work remaining at the Sprint Review meeting; It compares this figure with the remaining work at the previous Sprint Review meeting to see if the total project project could be completed at the desired time. This information is transparently shared with all stakeholders. Various trend-measuring tools are used to predict progress, such as burn-down, burn-up or cumulative flow.

- **Sprint Backlog**

Sprint Backlog includes the schedule for delivering the Product Backlog items and Increment selected for the Sprint and achieving the Sprint Goal. A task board with four columns is used for this purpose: The first column contains "Stories" where in the second column one can see tasks in the name of "ToDo". The third column presents the work in progress "InProgress" while the last one covers threads that are ready for delivery "Done". The Development Team tracks the total remaining work in each Daily Scrum to see how close it is to achieving the Sprint Goal.

- **Increment**

Increment is the sum of the values of the Product Backlog items completed during a Sprint and the Increments of all past Sprints. At the end of the Sprint, the Increment must meet the Scrum Team's "Definition of Done". Scrum Teams may have different Definitions of Done, but to ensure transparency, everyone in a team must have the same knowledge of the state of the work. This concept of Definition Done serves as a reference for the evaluation of work on the Increment.

CHAPTER 9

9.   COBIT

9.1.   WHAT IS ISACA?

Since COBIT is a framework developed by ISACA, let's start with a brief introduction to ISACA. ISACA (Information Systems Audit and Control Association) that was founded in 1969 under the name of Electronic Data Processing Auditors Association (EDPAA) is a global association helping individuals and enterprises achieve the positive potential of technology.

As technology powers today's World, ISACA aims to equip professionals with the knowledge, credentials, education and community to advance their careers and transform their organizations. ISACA leverages the expertise of its half-million engaged professionals in information and cyber security, governance, assurance, risk and innovation, as well as its enterprise performance subsidiary, CMMI Institute, to help advance innovation through technology. ISACA has a presence in more than 188 countries with more than 217 chapters and offices, especially in Istanbul and Ankara.

9.2.   HOW I MET COBIT?

I have always liked "white paper" documents which have small volumes and large horizons. Here spawned from a humble white paper titled "Control Objectives" and developed into broader guidance on control objectives, COBIT was first published in April 1996. Initially, COBIT was intended to provide guidance for auditors, but as it gained use, it also turned out to be a greater guidance for internal control. The next iteration, COBIT 2, was published in 1998 and provided additional guidance for controls.

After then COBIT2 was widely used as an audit and control manual. In 2000 COBIT3 was released as a management framework, with the development of additional guidance for the management of all IT functions. Here I first met this version. Immediately after graduating from university, I ran into the military service , worked

as a database programming officer, discharged and started to work. I chose to be an IT auditor, without knowing the wide world behind the word audit and being glad that I could use both technical and social aspects. Our team was doing IT audit of one of Turkey's largest banks and was using COBIT. When the third version was released, they said "Come on, Kemal, we translate it into Turkish and will use in audits". It was a time when we used the moonstar dictionary program with amazement and gratitude, a time when Google Translate or even Google itself did not exist. We translated all COBIT processes into Turkish and audited all processes on two large insurance companies that are affiliates of the bank. Yes, we were benefiting a lot while conducting audits, but I realized that COBIT had very good answers for IT units to manage their business properly, transparently and measurably.

Over time, COBIT discovered the need for governance beyond IT management. Since IT should actually align with the business strategy, in 2005 COBIT 4.0 was launched as an IT governance framework. As of 2007, COBIT 4.1 came out, reducing some confused control targets.

9.3.   COBIT 4.1 AND ITS IMPORTANCE FOR TURKEY

For many enterprises, information and the technology that supports it represent their most valuable, but often least understood, assets. Successful enterprises recognise the benefits of information technology and use it to drive their stakeholders' value. These enterprises also understand and manage the associated risks, such as increasing regulatory compliance and critical dependence of many business processes on Information Technology (IT).

The need for assurance about the value of IT, the management of IT-related risks and increased requirements for control over information are now understood as key elements of enterprise governance. Value, risk and control constitute the core of IT governance.

IT governance is the responsibility of executives and the board of directors, and consists of the leadership, organisational structures and processes that ensure that the enterprise's IT sustains and extends the organisation's strategies and objectives.

Control Objectives for Information and related Technology (COBIT®) provides good practices across a domain and process framework and presents activities in a manageable and logical structure. COBIT's good practices represent the consensus of experts. They are strongly focused more on control, less on execution.

These practices will help optimise IT-enabled investments, ensure service delivery and provide a measure against which to judge when things do go wrong. COBIT is a framework and supporting tool set that allow managers to bridge the gap with respect to control requirements, technical issues and business risks, and communicate that level of control to stakeholders.

COBIT enables the development of clear policies and good practice for IT control throughout enterprises.

COBIT 4.1 has defined IT control objectives in 34 processes under 4 domains.

PO Plan and Organise	AI Acquire and Implement	DS Deliver and Support	ME Monitor and Evaluate
PO1 Define a Strategic IT Plan	AI1 Identify Automated Solutions	DS1 Define and Manage Service Levels	ME1 Monitor and Evaluate IT Performance
PO2 Define the Information Architecture	AI2 Acquire and Maintain Application Software	DS2 Manage Third-party Services	ME2 Monitor and Evaluate Internal Control
PO3 Determine Technological Direction	AI3 Acquire and Maintain Technology Infrastructure	DS3 Manage Performance and Capacity	ME3 Ensure Compliance With External Requirements
PO4 Define the IT Processes, Organisation and Relationships	AI4 Enable Operation and Use	DS4 Ensure Continuous Service	ME4 Provide IT Governance
PO5 Manage the IT Investment	AI5 Procure IT Resources	DS5 Ensure Systems Security	
PO6 Communicate Management Aims and Direction	AI6 Manage Changes	DS6 Identify and Allocate Costs	
PO7 Manage IT Human Resources	AI7 Install and Accredit Solutions and Changes	DS7 Educate and Train Users	
PO8 Manage Quality		DS8 Manage Service Desk and Incidents	
PO9 Assess and Manage IT Risks		DS9 Manage the Configuration	
PO10 Manage Projects		DS10 Manage Problems	
		DS11 Manage Data	
		DS12 Manage the Physical Environment	
		DS13 Manage Operations	

The maturity of these processes is evaluated at 5 levels.

0 Non-existent	1 Initial / Ad Hoc	2 Repeatable but Intuitive	3 Defined	4 Managed and Measurable	5 Optimised

Maturity Level	Description
0 Non-existent	Complete lack of any recognisable processes. The enterprise has not even recognised that there is an issue to be addressed.
1 Initial/Ad Hoc	There is evidence that the enterprise has recognised that the issues exist and need to be addressed. There are, however, no standardised processes; instead, there are ad hoc approaches that tend to be applied on an individual or case-by-case basis. The overall approach to management is disorganised.
2 Repeatable but Intuitive	Processes have developed to the stage where similar procedures are followed by different people undertaking the same task. There is no formal training or communication of standard procedures, and responsibility is left to the individual. There is a high degree of reliance on the knowledge of individuals and, therefore, errors are likely.
3 Defined Process	Procedures have been standardised and documented, and communicated through training. It is mandated that these processes should be followed; however, it is unlikely that deviations will be detected. The procedures themselves are not sophisticated but are the formalisation of existing practices.
4 Managed and Measurable	Management monitors and measures compliance with procedures and takes action where processes appear not to be working effectively. Processes are under constant improvement and provide good practice. Automation and tools are used in a limited or fragmented way.
5 Optimised	Processes have been refined to a level of good practice, based on the results of continuous improvement and maturity modelling with other enterprises. IT is used in an integrated way to automate the workflow, providing tools to improve quality and effectiveness, making the enterprise quick to adapt.

COBIT is more important for the banking sector in Turkey compared to other countries or sectors. Because in the " Regulation On Bank Information Systems and Banking Processes Audit To Be Performed By External Audit Institutions" published by the Banking Regulation and Supervision Agency (BRSA) in 2010, the definition and use of COBIT has officially entered into the legislation:

- **Definitions and abbreviations (BDDK, 2010)[1]**

f) COBIT: Current version of Control Objectives Information and Related Technologies (CEBIT) which was published by Information Systems Audit and Control Association (ISACA) Information Technologies Governance Institute (ITGI),
k) Control target: Control targets in COBIT which provide a desired result or a target is acquired by making control procedures within a specific information systems activity,
n) Maturity model: The maturity model in COBIT

- **Information systems audit (BDDK,2010)[2]**

(1) The auditor assesses information systems general controls in respect of consistency, efficiency and adequacy within the scope he determined in accordance with materiality criteria.
(2) General controls are audited according to COBIT, from framework, standards or methodology taken as a basis in their establishment and considering the provisions of the regulations made by the Agency on the principles to be taken as a basis in information systems management in banks.
(3) As a complementary element for analysis studies relating to the consistency, efficiency and adequacy of general controls; maturity level of the process concerning the related control target within the scope of maturity model is also determined. All detailed control targets are taken into consideration while analyzing the maturity level of the process concerning the related control target.

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[1] BDDK, (2010). BAĞIMSIZ DENETİM KURULUŞLARINCA GERÇEKLEŞTİRİLECEK BANKA BİLGİ SİSTEMLERİ VE BANKACILIK SÜREÇLERİNİN DENETİMİ HAKKINDA YÖNETMELİK, 4.madde,
https://www.mevzuat.gov.tr/mevzuat?MevzuatNo=13712&MevzuatTur=7&MevzuatTertip=5

[2] BDDK, (2010). BAĞIMSIZ DENETİM KURULUŞLARINCA GERÇEKLEŞTİRİLECEK BANKA BİLGİ SİSTEMLERİ VE BANKACILIK SÜREÇLERİNİN DENETİMİ HAKKINDA YÖNETMELİK, 24.madde,
https://www.mevzuat.gov.tr/mevzuat?MevzuatNo=13712&MevzuatTur=7&MevzuatTertip=5

- **Situations not provisioned within the regulation (BDDK,2010)[3]**

(1) In case of situations not provisioned within this Regulation; RAAEA (Regulation on External Audit in Banks), international audit standards and the principles taking place within the COBIT are applied.

Thus, in 2010, audits in banks started to be carried out according to COBIT, the maturity of IT processes was evaluated, and corrective actions regarding the findings were taken in accordance with COBIT. Although the new version of COBIT was released in 2012, with the change in legislation, COBIT 4.1 continues to be used in bank audits until today.

9.4.   COBIT 5

COBIT 5, was published in 2012 to provide a comprehensive business framework for the governance of enterprise IT. COBIT 5 presents a model for the alignment of overall enterprise strategy with IT strategy, operates on a relatively simple foundation of five principles with seven enablers, and is aligned with several significant internationally recognized standards bodies, such as ISO/IEC and ITIL.

COBIT5 Principles   COBIT5 Enablers
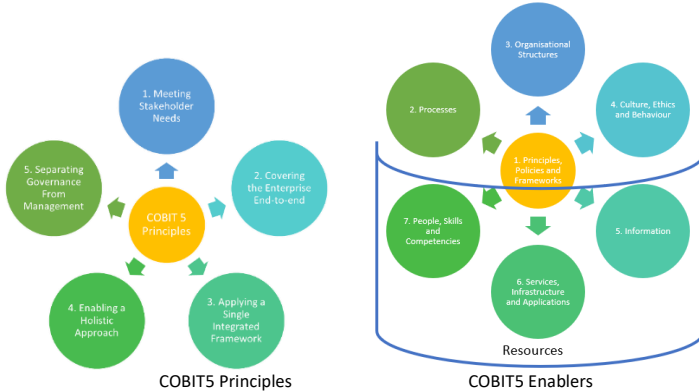
In the executive summary of COBIT 5 it is stated that the term 'governance' has moved to the forefront of business thinking in response to examples demonstrating

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[3] BDDK, (2010). BAĞIMSIZ DENETİM KURULUŞLARINCA GERÇEKLEŞTİRİLECEK BANKA BİLGİ SİSTEMLERİ VE BANKACILIK SÜREÇLERİNİN DENETİMİ HAKKINDA YÖNETMELİK, 42.madde,
https://www.mevzuat.gov.tr/mevzuat?MevzuatNo=13712&MevzuatTur=7&MevzuatTertip=5

the importance of good governance and, on the other end of the scale, global business mishaps. Successful enterprises have recognised that the board and executives need to embrace IT like any other significant part of doing business.

Boards and management—both in the business and IT functions—must collaborate and work together, so that IT is included within the governance and management approach. In addition, legislation is increasingly being passed and regulations implemented to address this need. COBIT 5 provides a comprehensive framework that assists enterprises in achieving their objectives for the governance and management of enterprise IT.

The COBIT 5 framework makes a clear distinction between governance and management. These two disciplines encompass different types of activities, require different organisational structures and serve different purposes. COBIT 5's view on this key distinction between governance and management is:
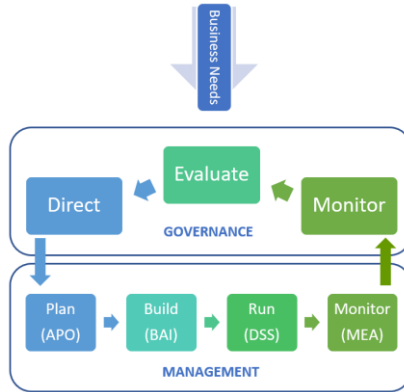
- **Governance:** Governance ensures that stakeholder needs, conditions and options are evaluated to determine balanced, agreed-on enterprise objectives to be achieved; setting direction through prioritisation and decision making; and monitoring performance and compliance against agreed-on direction and objectives. In most enterprises, overall governance is the responsibility of the board of directors under the leadership of the chairperson. Specific governance responsibilities may be delegated to special organisational structures at an appropriate level, particularly in larger, complex enterprises.

- **Management:** Management plans, builds, runs and monitors activities in alignment with the direction set by the governance body to achieve the enterprise objectives. In most enterprises, management is the responsibility of the executive management under the leadership of the chief executive officer (CEO).

The COBIT 5 process reference model divides the governance and management processes of enterprise IT into two main process domains:

- **Governance:** Contains five governance processes; within each process, evaluate, direct and monitor (EDM) practices are defined.

- **Management**: Contains four domains, in line with the responsibility areas of plan, build, run and monitor (PBRM), and provides end-to-end coverage of IT. These domains are an evolution of the COBIT 4.1 domain and process structure. The names of the domains are chosen in line with these main area designations, but contain more verbs to describe them:

  - Align, Plan and Organise (APO)
  - Build, Acquire and Implement (BAI)
  - Deliver, Service and Support (DSS)
  - Monitor, Evaluate and Assess (MEA)

COBIT 5 Processes

9.5.   COBIT 2019

COBIT 2019 was published in 2018. COBIT is now a framework for the governance and management of I&T (Information and Technology) for the entire enterprise. If you

have noticed here, instead of IT (information technologies), the term I&T (information and technology) has started to be used.

While IT is used for the organizational department, whose primary responsibility is technology, I&T is used to refer to all the information that the organization produces, processes and uses to achieve its goals, as well as the technology used to support it throughout the organization. Enterprise I&T means all the technology and information processing the enterprise puts in place to achieve its goals, regardless of where this happens in the enterprise. In other words, enterprise I&T is not limited to the IT department of an organization but certainly includes it.

COBIT defines the components to build and sustain a governance system: processes, organizational structures, policies and procedures, information flows, culture and behaviors, skills, and infrastructure. As you remember, these components were named as enablers in COBIT5. COBIT defines the design factors and governance components that should be considered by the enterprise to build a best-fit governance system.

So, what is COBIT not?

- COBIT is not a full description of the whole IT environment of an enterprise.
- COBIT is not a framework to organize business processes.
- COBIT is not an (IT) technical framework to manage all technology.
- COBIT does not make or prescribe any IT-related decisions. It will not decide what the best IT strategy is, what the best architecture is, or how much IT can or should cost. Rather, COBIT defines all the components that describe which decisions should be taken, and how and by whom they should be taken.

For information and technology to contribute to enterprise goals, a number of governance and management objectives should be achieved. Basic concepts relating to governance and management objectives are:

- A governance or management objective always relates to one process (with an identical or similar name) and a series of related components of other types to help achieve the objective.

- A governance objective relates to a governance process (depicted on the dark blue background in figure 1.2), while a management objective relates to management processes (depicted on the lighter blue background in figure 1.2). Boards and executive management are typically accountable for governance processes, while management processes are the domain of senior and middle management.

The governance and management objectives in COBIT 2019 are grouped in five domains as in COBIT5.

COBIT 2019 Model

CHAPTER 10

10. ITIL

10.1. THE HISTORY OF ITIL?

The IT Infrastructure Library (ITIL) is a library of volumes describing a framework of best practices for delivering IT services. ITIL has undergone various revisions in its history and currently consists of five books, each covering the various processes and stages of the IT service lifecycle. ITIL's systematic approach to IT service management can help businesses manage risk, strengthen customer relations, establish cost-effective practices, and build a stable IT environment that allows for growth, scale and change.

ITIL was developed in the 1980s by the British government's Central Computing and Telecommunications Agency (CCTA). ITIL consisted of more than 30 books that were developed and published over time, originally coding best practices in information technology gathered from many sources around the world. For example, IBM says its four-volume series on systems management concepts, known as the Yellow Books, provides a vital input to the original ITIL books.

In April 2001, CCTA were incorporated into the Office of Government Commerce (OGC), which is now known as the Cabinet Office. The OGC adopted the project as part of its mission to work with the U.K. public sector as a catalyst to achieve efficiency, value for money in commercial activities, and improved success in the delivery of programs and projects. The goal wasn't to create a proprietary product that could be commercialized; rather, it was to gather best practices that could help what the government recognized as the growing reliance on IT and the painful lack of standard procedures that increased costs and allowed errors to persist. It quickly became apparent that distributing these best practices would profit both public and private-sector organizations.

Over the years, ITIL's credibility and utility became recognized, and in 2005 its practices contributed to and aligned with the ISO/IEC 20000 Service Management standard, the first international standard for IT service management; it is based on British standard BS15000.

Since 2013, ITIL is owned by Axelos, a joint venture between the Cabinet Office and Capita. In 2018, Axelos announced ITIL-4, a major overhaul to the entire framework. ITIL 4, which started rolling out in Q1 of 2019, offers a more agile, flexible and customizable version. The latest version encourages less siloes, more collaboration, communication across the entire business and integrating agile and DevOps into ITSM (IT Service Management) strategies.

10.2.   WHAT IS ITIL-4?

The pace of development in the IT industry over the past decade has accelerated the need for a completely redefined version of ITIL. It was not only technology and the role of IT in business that had made huge progress, but also the practices used in the IT industry had also gone through some serious evolution, with Agile and DevOps approaches, cloud technology, and the combination of IT with many other domains.

With the new ITIL 4, a major step has been taken to cover the latest developments. The ITIL 4 guidance supports modern ways of co-creating value in an active collaboration of stakeholders, using an Agile approach in a customer-focused setting. ITI- 4 brings ITIL up to date by re-shaping much of the established ITSM practices in the context of customer experience, value streams, and digital transformation, as well as embracing new ways of working, such as Lean, Agile, and DevOps. Its holistic approach not only underpins the management of IT services, but now also supports other domains, enabling the integration of IT with the business and with other support domains.

10.3.   ITIL-4 FRAMEWORK

The key components of the ITIL-4 framework are the ITIL service value system (SVS) and the four dimensions model of service management.

10.3.1.   FOUR DIMENSION MODEL OF SERVİCE MANAGEMENT

To ensure a holistic approach to service management, ITIL 4 outlines four dimensions of service management. By giving each of the four dimensions an appropriate amount of focus, an organization ensures its SVS remains balanced and effective.

The four dimensions are:

- Organizations and People
- Information and Technology
- Partners and Suppliers
- Value Streams and Processes
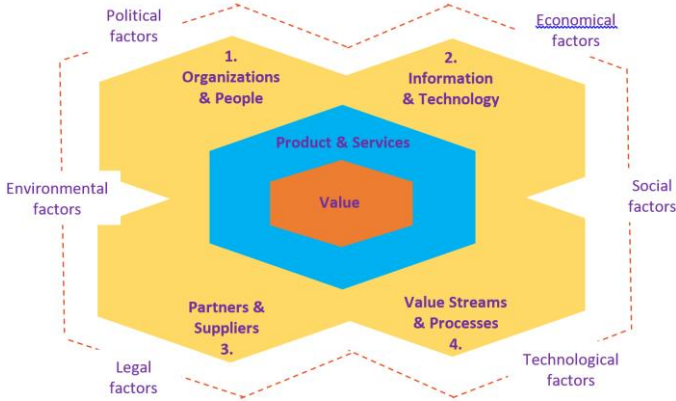
The Four Dimensions of Service Management

Each dimension lends vital importance for both service management and brings balance to the Service Value System (SVS) itself. If any of these dimensions is not properly addressed, the connected product or service may become unavailable, not meeting customers' expectations of quality and efficiency. The four dimensions represent a holistic approach to service management, and organizations should ensure that there is a balance of focus between each dimension. The impact of external factors on the four dimensions should also be considered. All four dimensions and the external factors that affect them should be addressed, considering emerging trends and opportunities. It is essential that an organization's SVS is considered from all four dimensions, as the failure to adequately address or account for one dimension, or an external factor, can lead to sub-optimal products and services.

- **Organizations and People;** Includes people who do and manage the work. The organizations and people dimension sets out the people aspects of service management to be considered when designing, operating and changing service offerings. People include employees, managers, executives, customers, supplier employees, or anybody else who is involved in the creation or consumption of services.

- **Information and Technology;** How information and tools help create value. In the Information Age, information and technologies which store and process of information are critical enablers of value delivery. Indeed, in many cases information is the value. When thinking about information and technology, we must consider two angles: How information an technology support individual service value streams and how they support the broader service management capabilities. Other aspects you need to consider are skills and security. Do you

have the right people to build, maintain, secure and support the technology you are bringing in? For example, organizations launching new information services based on big data architectures are finding it difficult to find people with the right skills.

- **Partners and Suppliers;** Every organization is a provider and consumer of services—they need partners and suppliers to help deliver their own services. However, the breadth and depth to which organizations integrate suppliers into their value chains varies depending on in-house capabilities, sourcing biases, and regulatory requirements.

- **Value Streams and Processes;** How the work happens, and why. Value Streams and Processes introduces the new Service Value Chain which is central to ITIL-4. The ITIL-4 service value chain model is flexible, evolved to support linear flows and iterative approaches (such as Agile). Each service value stream (the chain of activity which outputs an outcome for the customer) combines different types of activity in a different order. Organizations should map a value stream for every product or service to provide a holistic picture of how value is created. ITIL 4 provides examples of how the service value chain operating model supports creation of different types of value; including incident resolution, resolving a software issue, creating an IT service, and the development of new software.

10.3.2. ITIL4 SERVICE VALUE SYSTEM (SVS)

The ITIL service value system (SVS describes how all the components and activities of the organization work together as a system to enable value creation. The key inputs to the SVS are opportunity and demand. Opportunities represent options or possibilities to add value for stakeholders or otherwise improve the organization. Demand is the need or desire for products and services among internal and external consumers. The outcome of the SVS is value, that is, the perceived benefits, usefulness, and importance of something.

The core components of the ITIL SVS are:
- The ITIL Service Value Chain
- The ITIL Practices
- The ITIL Guiding Principles
- Governance
- Continual Improvement
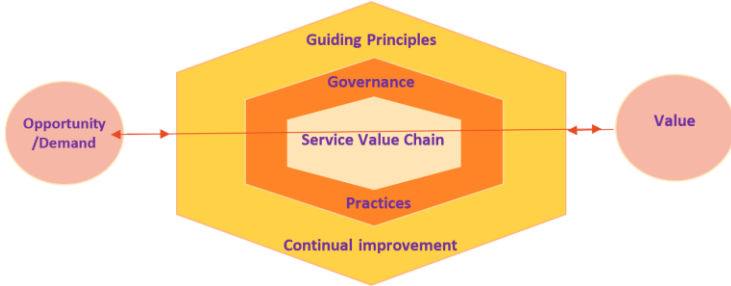
ITIL Service Value System (SVS)

- **The ITIL Service Value Chain** is a set of interconnected activities that an organization performs in order to deliver a valuable product or service to its consumers and to facilitate value realization. It provides an operating model for service providers that covers six key activities, applying practices to continually improve the enabled values.

- **The ITIL practices** are sets of organizational resources designed for performing work or accomplishing an objective. Activities in the service value chain can be based on established practices.

- **The ITIL guiding principles** are recommendations that can guide an organization in all circumstances, regardless of changes in its goals, strategies, type of work, or management structure. The ITIL guiding principles assure that the organization performs in a consistent, effective and efficient way.

- **Governance** is the means by which an organization is directed and controlled. The organization's governance is based on a consistent set of guiding principles. Governance enables the organization to ensure that its operations are always aligned with its strategy.

- **Continual improvement** is a recurring organizational activity performed at all levels to ensure that an organization's performance continually meets stakeholders' expectations.

10.3.2.1. ITIL4 GUIDING PRINCIPLES

One of the most important components of the ITIL Service Value System is the ITIL Guiding Principles. A guiding principle is a recommendation that provides universal and enduring guidance to an organization, which applies in all circumstances, regardless of changes in its goals, strategies, type of work, or management structure. A guiding principle is universal and enduring. The guiding principles defined here

embody the core messages of ITIL and of service management in general, supporting successful actions and good decisions of all types and at all levels. They can be used to guide organizations in their work as they adopt a service management approach and adapt ITIL guidance to their own specific needs and circumstances. The guiding principles encourage and support organizations in continual improvement at all levels.

The ITIL Guiding 7 Principles are as follows:
- Focus on value
- Start where you are
- Progress iteratively with feedback
- Collaborate and promote visibility
- Think and work holistically
- Keep it simple and practical
- Optimize and automate

ITIL Guiding Principles

- **Focus on value:** Everything that the organization does needs to map, directly or indirectly, to value for the stakeholders. The focus on value principle encompasses many perspectives, including the experience of customers and users.

- **Start where you are:** Do not start from scratch and build something new without considering what is already available to be leveraged. There is likely to be a great deal in the current services, processes, programmes, projects, and people that can be used to create the desired outcome. The current state should be investigated and observed directly to make sure it is fully understood.

- **Progress iteratively with feedback:** Do not attempt to do everything at once. Even huge initiatives must be accomplished iteratively. By organizing work into smaller, manageable sections that can be executed and completed in a timely manner, it is easier to maintain a sharper focus on each effort. Using feedback before, throughout, and after each iteration will ensure that actions are focused and appropriate, even if circumstances change.

- **Collaborate and promote visibility:** Working together across boundaries produces results that have greater buy-in, more relevance to objectives, and increased likelihood of long-term success. Achieving objectives requires information, understanding, and trust. Work and consequences should be made visible, hidden agendas avoided, and information shared to the greatest degree possible.

- **Think and work holistically:** No service, or element used to provide a service, stands alone. The outcomes achieved by the service provider and service consumer will suffer unless the organization works on the service as a whole, not just on its parts. Results are delivered to internal and external customers through the effective and efficient management and dynamic integration of information, technology, organization, people, practices, partners, and agreements, which should all be coordinated to provide a defined value.

- **Keep it simple and practical:** If a process, service, action or metric fails to provide value or produce a useful outcome, eliminate it. In a process or procedure, use the minimum number of steps necessary to accomplish the objective(s). Always use outcome-based thinking to produce practical solutions that deliver results.

- **Optimize and automate:** Resources of all types, particularly HR, should be used to their best effect. Eliminate anything that is truly wasteful and use technology to achieve whatever it is capable of. Human intervention should only happen where it really contributes value.

10.3.2.2. GOVERNANCE

Every organization is directed by a governing body, i.e. a person or group of people who are accountable at the highest level for the performance and compliance of the organization. All sizes and types of organization perform governance activities. The governing body is accountable for the organization's compliance with policies and any external regulations. Organizational governance evaluates, directs, and monitors all the organization's activities, including those of service management.

There are three main activities by which governance is realized:

- Direct
- Monitor
- Evaluate

- **Direct:** This involves the assignment of responsibility for organizational strategy and policies, and the direction of their preparation and implementation. Strategy sets the direction and prioritization for organizational activity including vision, mission and plans. Policies establish the requirements for behavior by those participating in organizational activities, whether they are staff, vendors or contractors.

- **Monitor:** This involves determining whether the performance of the organization and its practices, products, and services is in line with the strategy and policies set in the direct activity.

- **Evaluate:** This involves the performance of regular reviews of the organization, its strategy, portfolios, and relationships with other parties, accounting for changing external circumstances and stakeholder requirements.

The service value system (SVS) is a universal model that can be applied across an entire organization, or to one or more of its units or products. So, if you're delegating governance authority across different levels, then the governance body should retain oversight to ensure alignment with the objectives and priorities of the organization. The role and position of governance in the ITIL SVS depends on how the SVS is applied in an organization. The SVS is a universal model that can be applied to an organization as a whole, or to one or more of its units or products. In the latter case, some organizations delegate authority to perform governance activities at different levels. The governing body of the organization should retain oversight of this to ensure alignment with the objectives and priorities of the organization.

In ITIL 4, the ITIL guiding principles and continual improvement apply to all components of the SVS, including governance. Therefore, the governance body can adopt and adapt the guiding principles and communicate them across the organization as part of the "direct" activity. The governance body can also "monitor" outcomes of continual improvement activities and measurement of value.

10.3.2.3. SERVICE VALUE CHAIN (SVC)

The central element of the Service Value System (SVS) is the Service Value Chain (SVC), an operating model which outlines the key activities required to respond to demand and facilitate value realization through the creation and management of products and services. The Service Value Chain (SVC) is the core part of SVS which has

all the key activities, which are required to be performed for accomplishing the service value, through the service outputs and outcomes. The ITIL service value chain defines six key activities that can be combined in many ways, forming multiple value streams. The SVC is flexible enough to be adapted to multiple approaches to address the need for multiple models of service management. The adaptability of the value chain enables organizations to react to changing demands from their stakeholders in the most effective and efficient ways.

SVC is an operating model for the creation, delivery and ongoing improvement of services. It outlines the key activities required to create value in response to demand, through the creation and delivery of products and services. In ITIL, there are six activities in the SVC which represent the steps an organization takes in the creation of value.

The six service value chain activities and interactions;

- Plan
- Improve
- Engage
- Design & Transition
- Obtain / Build
- Deliver & Support

ITIL Service Value Chaini (SVC)
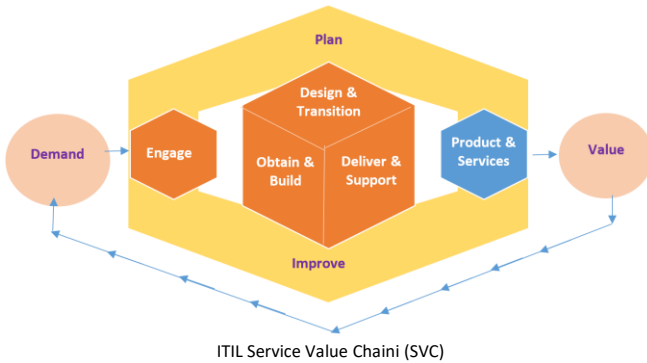
- **Plan:** The purpose of the plan value chain activity is to ensure a shared understanding of the vision, current status, and improvement direction for all four dimensions and all products and services across the organization.

- **Improve:** The purpose of the improve value chain activity is to ensure continual improvement of products, services, and practices across all value chain activities and the four dimensions of service management. All the services / products perform at certain levels and they should be improved on a continual basis.

Improvement is not one folded, it is multi-folded. That is, improving the processes, practices, services, products, individual skills etc. are essential. This needs consideration of all the four dimensions of the service management.

- **Engage:** The purpose of the engage value chain activity is to provide a good understanding of stakeholder needs, transparency, and continual engagement and good relationships with all stakeholders. The service can be termed as successful, when the stakeholders realize the value. Value is always defined in customer perspective. However, the need of all the stakeholders cannot be ignored. The value realization is critical and only then the utility & warranty defined would make sense. It is very essential to engage with the stakeholders continually. This will help in obtaining a good understanding of the needs of stakeholders, and will create transparency and establish a good relationship with the stakeholders.

- **Design and Transition:** The purpose of the design and transition value chain activity is to ensure that products and services continually meet stakeholder expectations for quality, costs, and time to market. Releasing the services & products to market in time is a very important factor to ensure the utilization of the services and products. Further, the required quality aspects like products features, functionalities, and performance has to meet the defined expectations and has to be produced within the defined budget.

- **Obtain and Build:** The purpose of the obtain/build value chain activity is to ensure that service components are available when and where they are needed, and meet agreed specifications. This activity focuses on acquiring the resources required to build the services, integrate, test and confirm the performance, which has to be in line with the specification established in architectures.

- **Deliver and Support:** The purpose of the deliver and support value chain activity is to ensure that services are delivered and supported according to agreed specifications and stakeholders' expectations. This activity focus on delivering the services or products to the customers and ensures that they are supported throughout their lifecycle. It is essential to ensure that customers get the value required.

10.3.2.4. CONTINUAL IMPROVEMENT

Continual improvement takes place in all areas of the organization and at all levels,from strategic to operational. To maximize the effectiveness of services, each person who contributes to the provision of a service should keep continual improvement in mind, and should always be looking for opportunities to improve. The continual improvement model applies to the SVS in its entirety, as well as to all of the organization's products, services, service components, and relationships.

To support continual improvement at all levels, the ITIL SVS includes:

- The ITIL continual improvement model; which provides organizations with a structured approach to implementing improvements
- The improve service value chain activity, which embeds continual improvement into the value chain
- The continual improvement practice, supporting organizations in their day-to-day improvement efforts.

The ITIL continual improvement model can be used as a high-level guide to support improvement initiatives. Use of the model increases the likelihood that ITSM (IT Service Management) initiatives will be successful, puts a strong focus on customer value, and ensures that improvement efforts can be linked to the organization's vision. The model supports an iterative approach to improvement, dividing work into manageable pieces with separate goals that can be achieved incrementally.

The ITIL continual improvement model is important to remember that the scope and details of each step of the model will vary significantly based on the subject and the type of improvement. It should be recognized that this model can serve as a workflow, but it can also be used simply as a high-level reminder of a sound thought process to ensure improvements are properly managed. The flow aims that improvements are linked to the organization's goals and are properly prioritized, and that improvement actions produce sustainable results.

ITIL Continual Improvement Model

- **What is the vision? :** Each improvement initiative should support the organization's goals and objectives. The first step of the continual improvement model is to define the vision of the initiative. This provides context for all subsequent decisions and links individual actions to the organization's vision for the future.

- **Step 2: Where are we now? :** The success of an improvement initiative depends on a clear and accurate understanding of the starting point and the impact of the initiative. An improvement can be thought of as a journey from Point A to Point B, and this step clearly defines what Point A looks like. A journey cannot be mapped out if the starting point is not known.

- **Step 3: Where do we want to be? :** Just as the previous step (Step 2) describes Point A on the improvement journey, Step 3 outlines what Point B, the target state for the next step of the journey, should look like. A journey cannot be mapped out if the destination is not clear.

- **Step 4: How do we get there? :** The plan for Step 4 can be a straightforward and direct route to completing a single simple improvement, or it may be more involved. The most effective approach to executing the improvement may not be clear, and it will sometimes be necessary to design experiments that will test which options have the most potential. Even if the path to follow is clear, it may be most effective to carry out the work in a series of iterations, each of which will move the improvement forward part of the way. With each iteration, there is an opportunity to check progress, re-evaluate the approach, and change direction if appropriate.

- **Step 5: Take action :** In Step 5 the plan for the improvement is acted upon. This could involve a traditional waterfall-style approach, but it could be more appropriate to follow an Agile approach by experimenting, iterating, changing directions, or even going back to previous steps.

- **Step 6: Did we get there?:** Too often, once an improvement plan is set in motion, it is assumed that the expected benefits have been achieved, and that attention can be redirected to the next initiative. In reality, the path to improvement is filled with various obstacles, so success must be validated.

- **Step 7: How do we keep the momentum going? :** If the improvement has delivered the expected value, the focus of the initiative should shift to marketing these successes and reinforcing any new methods introduced. This is to ensure that the progress made will not be lost and to build support and momentum for the next improvements.

10.3.2.5. ITIL4 MANAGEMENT PRACTICES

Management practices make up another core component of the ITIL® 4 Service Value System (SVS). In ITIL, a management practice is a set of organizational resources designed for performing work or accomplishing an objective.

General Management Practices	Services Management Practices	Technical Management Practices
1. Architecture management	1. Availability management	1. Deployment management
2. Continual improvement	2. Business management	2. Infrastructure&platform mng.
3. Information security mng.	3. Capacity and performance mng.	3. Software development& mng.
4. Knowledge management	4. Change control	
5. Measurement and reporting	5. Incident management	
6. Organizational change mng.	6. IT assess management	
7. Portfolio management	7. Monitoring and event management	
8. Project management	8. Problem management	
9. Relationship management	9. Release management	
10. Risk management	10. Service catalogue management	
11. Services financial anagement	11. Service configuration management	
12. Strategy management	12. Service continuity management	
13. Supplier management	13. Service design	
14. Workforce and talent mng.	14. Service desk	
	15. Service level management	
	16. Service request management	
	17. Service validation and testing	

ITIL4 Management Practices

The ITIL SVS includes 14 general management practices, 17 service management practices, and three technical management practices, all of which are subject to the four dimensions of service management.

- General Management Practices have been adopted and adapted for service management from general business management domains (14 domains).
- Service Management Practices have been developed in service management and ITSM industries (17 domains).
- Technical Management Practices have been adapted from technology management domains for service management purposes by expanding or shifting their focus from technology solutions to IT services (3 domains).

a) General Management Practices

1. **Architecture management:** The purpose of the architecture management practice is to provide an understanding of all the different elements that make up an organization and how those elements interrelate, enabling the organization to effectively achieve its current and future objectives. It provides the principles, standards, and tools that enable an organization to manage complex change in a structured and Agile way.

2. **Continual improvement:** The purpose of the continual improvement practice is to align the organization's practices and services with changing business needs through the ongoing improvement of products, services, and practices, or any element involved in the management of products and services.

3. **Information security management:** The purpose of the information security management practice is to protect the information needed by the organization to conduct its business. This includes understanding and managing risks to the confidentiality, integrity, and availability of information, as well as other aspects of information security such as authentication and nonrepudiation.

4. **Knowledge management:** The purpose of the knowledge management practice is to maintain and improve the effective, efficient, and convenient use of information and knowledge across the organization.

5. **Measurement and reporting:** The purpose of the measurement and reporting practice is to support good decision-making and continual improvement by decreasing the levels of uncertainty. This is achieved through the collection of relevant data on various managed objects and the valid assessment of this data in an appropriate context. Managed objects include, but are not limited to, products and services, practices and value chain activities, teams and individuals, suppliers and partners, and the organization as a whole.

6. **Organizational change management:** The purpose of the organizational change management practice is to ensure that changes in an organization are smoothly and successfully implemented, and that lasting benefits are achieved by managing the human aspects of the changes.

7. **Portfolio management:** The purpose of the portfolio management practice is to ensure that the organization has the right mix of programmes, projects, products, and services to execute the organization's strategy within its funding and resource constraints.

8. **Project management:** The purpose of the project management practice is to ensure that all projects in the organization are successfully delivered. This is achieved by planning, delegating, monitoring, and maintaining control of all aspects of a project, and keeping the motivation of the people involved.

9. **Relationship management**: The purpose of the relationship management practice is to establish and nurture the links between the organization and its stakeholders at strategic and tactical levels. It includes the identification, analysis, monitoring, and continual improvement of relationships with and between stakeholders.

10. **Risk management:** The purpose of the risk management practice is to ensure that the organization understands and effectively handles risks. Managing risk is essential to ensuring the ongoing sustainability of an organization and creating value for its customers. Risk management is an integral part of all organizational activities and therefore central to the organization's SVS.

11. **Service financial management:** The purpose of the service financial management practice is to support the organization's strategies and plans for service management by ensuring that the organization's financial resources and investments are being used effectively.

12. **Strategy management:** The purpose of the strategy management practice is to formulate the goals of the organization and adopt the courses of action and allocation of resources necessary for achieving those goals. Strategy management establishes the organization's direction, focuses effort, defines or clarifies the organization's priorities, and provides consistency or guidance in response to the environment.

13. **Supplier management:** The purpose of the supplier management practice is to ensure that the organization's suppliers and their performances are managed appropriately to support the seamless provision of quality products and services. This includes creating closer, more collaborative relationships with key suppliers to uncover and realize new value and reduce the risk of failure.

14. **Workforce and talent management:** The purpose of the workforce and talent management practice is to ensure that the organization has the right people with the appropriate skills and knowledge and in the correct roles to support its business objectives. The practice covers a broad set of activities focused on successfully engaging with the organization's employees and people resources, including planning, recruitment, onboarding, learning and development, performance measurement, and succession planning.

b)   Service Management Practices

1. **Availability management:** The purpose of the availability management practice is to ensure that services deliver agreed levels of availability to meet the needs of customers and users.

2. **Business analysis:** The purpose of the business analysis practice is to analyse a business or some element of it, define its associated needs, and recommend solutions to address these needs and/or solve a business problem, which must facilitate value creation for stakeholders. Business analysis enables an organization to communicate its needs in a meaningful way, express the rationale for change, and design and describe solutions that enable value creation in alignment with the organization's objectives.

3. **Capacity and performance management:** The purpose of the capacity and performance management practice is to ensure that services achieve agreed and expected performance, satisfying current and future demand in a cost- effective way.

4. **Change control:** The purpose of the change control practice is to maximize the number of successful service and product changes by ensuring that risks have been properly assessed, authorizing changes to proceed, and managing the change schedule.

5. **Incident management:** The purpose of the incident management practice is to minimize the negative impact of incidents by restoring normal service operation as quickly as possible.

6. **IT asset management:** The purpose of the IT asset management practice is to plan and manage the full lifecycle of all IT assets, to help the organization:
   - Maximize value,
   - Control costs,
   - Manage risks,
   - Support decision-making about purchase, re-use, retirement, and disposal of assets
   - Meet regulatory and contractual requirements

7. **Monitoring and event management:** The purpose of the monitoring and event management practice is to systematically observe services and service components, and record and report selected changes of state identified as events. This practice identifies and prioritizes infrastructure, services, business processes, and information security events, and establishes the appropriate response to those events, including responding to conditions that could lead to potential faults or incidents.

8. **Problem management:** The purpose of the problem management practice is to reduce the likelihood and impact of incidents by identifying actual and potential causes of incidents, and managing workarounds and known errors.

9. **Release management:** The purpose of the release management practice is to make new and changed services and features available for use.

10. **Service catalogue management:** The purpose of the service catalogue management practice is to provide a single source of consistent information on all services and service offerings, and to ensure that it is available to the relevant audience.

11. **Service configuration management:** The purpose of the service configuration management practice is to ensure that accurate and reliable information about the configuration of services, and the Cis (Configuration item) that support them, is available when and where it is needed. This includes information on how CIs are configured and the relationships between them.

12. **Service continuity management:** The purpose of the service continuity management practice is to ensure that the availability and performance of a service are maintained at sufficient levels in case of a disaster. The practice provides a framework for building organizational resilience with the capability of producing an effective response that safeguards the interests of key stakeholders and the organization's reputation, brand, and value-creating activities.

13. **Service design:** The purpose of the service design practice is to design products and services that are fit for purpose, fit for use, and that can be delivered by the organization and its ecosystem. This includes planning and organizing people, partners and suppliers, information, communication, technology, and practices for new or changed products and services, and the interaction between the organization and its customers.

14. **Service desk:** The purpose of the service desk practice is to capture demand for incident resolution and service requests. It should also be the entry point and single point of contact for the service provider with all of its users.

15. **Service level management:** The purpose of the service level management practice is to set clear businessbased targets for service levels, and to ensure that delivery of services is properly assessed, monitored, and managed against these targets.

16. **Service request management:** The purpose of the service request management practice is to support the agreed quality of a service by handling all pre-defined, user-initiated service requests in an effective and user-friendly manner.

17. **Service validation and testing:** The purpose of the service validation and testing practice is to ensure that new or changed products and services meet defined requirements. The definition of service value is based on input from customers, business objectives, and regulatory requirements, and is documented as part of the value chain activity of design and transition. These inputs are used to establish measurable quality and performance indicators that support the definition of assurance criteria and testing requirements.

c) Technical Management Practices

1. **Deployment management:** The purpose of the deployment management practice is to move new or changed hardware, software, documentation, processes, or any other component to live environments. It may also be involved in deploying components to other environments for testing or staging.

2. **Infrastructure and platform management:** The purpose of the infrastructure and platform management practice is to oversee the infrastructure and platforms used by an organization. When carried out properly, this practice enables the monitoring of technology solutions available to the organization, including the technology of external service providers.

3. **Software development and management:** The purpose of the software development and management practice is to ensure that applications meet internal and external stakeholder needs, in terms of functionality, reliability, maintainability, compliance, and auditability.

10.4. ITIL-4 AS CONCLUSION

ITIL helps organizations succeed at service management. Organizational success is largely defined by how efficiently and effectively an organization can deliver its products and services to the market in a manner of followings:

•   Meets customer expectations
•   Beats competitor offerings
•   Aligns with legal and regulatory requirements

To do this today, in the 2020s, companies must move faster to keep up with the ever-changing needs of consumers. This is particularly true in the era of social media, user preferences and options are multiplying exponentially and changing uncontrollably.

For many organizations this digital transformation also includes a shift from a product to a digital service company. This age, the "Fourth Industrial Revolution", is characterized by the digital transformation of the world and the unavoidable interaction between humans, digital technologies, and physical assets. You should keep up with the changes in technology—while still delivering innovative, cost-effective products and services to meet the needs of your market.

CHAPTER 11

11. CLOUD COMPUTING

11.1. INTRODUCTION TO CLOUD COMPUTING

Cloud computing is a model of accessing services (business/applications) over the Internet which will be hosted either at a third party location (provider) or at the agencies data centre (consolidated). These services (servers, applications, storage, etc.) can be broadly accessed over various channels (workstations, laptops, mobile phones, tablets) from anywhere, made available on-demand. These services are made available from a pool of resources (virtual/physical) which may be used by multiple agencies and can be shrunk or expanded as per requirements. The service is measured which means that the agencies will pay for only the time the resources were utilized.

The objectives for the agencies in adopting cloud computing strategy is as follows:
a. Optimum utilization of infrastructure
b. Speeding up the development and deployment of applications
c. Easy replication of successful applications across similar agencies to avoid duplication of effort and cost in development of similar applications
d. Availability of certified applications following common standards at one place.

Keeping in mind the objectives of adoption of cloud, the agencies should be able to realize the business and technology benefits which are mentioned below:

a. Facilitating federation within agencies by leveraging a solution to a broader set of users instead of just serving one agency
b. The standardized practices, regulatory requirements and restrictions can be propagated through the cloud solution to all the agencies while at the same time each agency can still retain its autonomy
c. Have an improved collaboration through the cross-collaborative business solution
d. Increased focus on delivering services without the need to make huge investments in IT
e. Faster time to market to launch new services
f. Reduced operational costs with reduction in costs of hardware, software and licensing
g. Lower development costs from development and hosting of services and new capabilities.

11.2. THE PRINCIPLES OF CLOUD COMPUTING

Principles for the cloud computing adoption framework form a basis of conduct. The agencies should adopt cloud considering the cloud-first strategy. The cloud-first strategy focuses on reducing the IT costs by leveraging the benefits of using shared infrastructure and services. The agencies will only pay for the resources consumed. Mentioned below are the principles for the adoption of cloud computing for the agencies.

a. **Enablement:** The agencies should plan for cloud computing as a strategic enabler, rather than as an outsourcing arrangement or technical platform

b. **Cost/Benefit:** Agencies should evaluate the benefits of cloud adoption based on a full understanding of the costs of cloud compared with the costs of other technology platform business solutions

c. **Enterprise Risk:** Agencies should take an enterprise risk management (ERM) perspective to manage the adoption and use of cloud

d. **Capability:** Agencies adopting the cloud should integrate the full extent of capabilities that cloud providers offer with internal resources to provide a comprehensive technical support and delivery solution

e. **Accountability:** Agencies should manage accountabilities by clearly defining internal and provider responsibilities

f. **Trust:** Agencies should make trust an essential part of cloud solutions, and build trust into all business processes that depend on cloud computing.

11.3. THE MODELS OF CLOUD COMPUTING

Cloud computing promotes availability and is described by five essential characteristics, three primary service models and four deployment models.

| Characteristics	Service Models	Deployment Models
• On-demand self service • Broad network access • Rapid elasticity • Rapid provisioning • Measured service	• Software as a Service (SaaS) • Platform as a Service (PaaS) • Infrastructure as a Service (IaaS)	• Public Cloud • Private Cloud • Hybrid Cloud • Community Cloud

The Models of Cloud Computing

11.3.1. CHARACTERISTIC OF CLOUD

The five essential characteristics of cloud computing defined by National Institute of Standards and Technology (NIST), differentiate them from traditional IT and are accepted globally. The five characteristics are briefly defined below:

a. **On-demand self-service:** The agencies can provision computing capabilities, such as server time and network storage, as needed automatically without requiring human interaction with a service provider

b. **Broad network access**: Any service (business/support/applications) is available over the network and can be accessed by the agencies via mobile phones, tablets, laptops, and workstations

c. **Resource pooling:** The provider's computing resources will be pooled to serve agencies using a multi-tenant model, with different physical and virtual resources dynamically assigned and reassigned according to demand

d. **Rapid elasticity:** Any service can be elastically provisioned and released, in some cases automatically, to scale rapidly outward and inward commensurate with demand. To the agencies, the capabilities available for provisioning will appear to be unlimited and can be appropriated in any quantity at any time

e. **Measured service:** Cloud systems automatically control and optimize resource use by leveraging a metering capability at some level of abstraction appropriate to the type of service (e.g., storage, processing, bandwidth, and active user accounts). Resource usage can be monitored, controlled, and reported, providing transparency for both the provider and the individual agencies of the utilized service

Multi-tenancy is another characteristic not widely recognized by NIST, but still accepted globally. It is the use of same resources or application by multiple agencies that may belong to the agencies or different organisations (both public and private), and is a very important characteristic of public cloud.

Multi-tenancy in Private Cloud

Multi-tenancy in Public Cloud
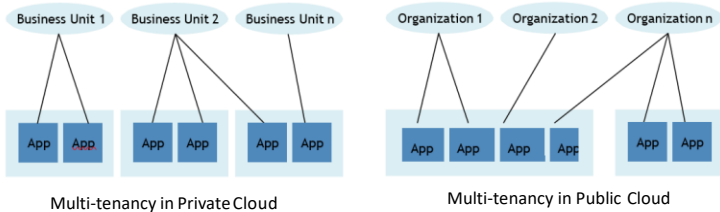
11.3.2. ADOPTION MODELS OF CLOUD COMPUTING

The first step for the agencies towards adoption of cloud is to choose the delivery model on which services will be offered. The services on cloud can be leveraged by adopting any of the below models:

a. **As a public cloud** in which a service provider will make services, such as applications and storage, available to the agencies over the Internet on a pay-per usage mode

b. **As a private cloud** that will be hosted within the data centre of the agencies; or as a private cloud that will be hosted externally by a third party provider also known as a virtual private cloud. The private cloud will give the agencies to retain the ability to standardize and implement its own best practices.

c. **As a hybrid cloud,** which is a combination of private and public cloud.

d. **As a community cloud,** where the cloud infrastructure will be shared by several government organisations of the same domain (e.g. governments, dependent agencies, etc.)

Cloud Model	Infrastructure owned by	Infrastructure managed by	Location	Consumed by
Public	Cloud service provider	Cloud service provider	Cloud provider service	Multiple organisations
Private	Agencies	Agencies	Agencies owned data centre	Agencies
Virtual Private Cloud	Cloud service provider	Cloud service Provider	Cloud provider service	Agencies
Hybrid	Both	Both	Both	Agencies, private entities
Community	Cloud service provider or agencies	Cloud service provider or agencies	Cloud service provider or agencies	Agencies, connected third parties

Adoption Models of Cloud

11.3.3. SERVİCE MODELS OF CLOUD COMPUTING

The second step for the agencies towards adopting the cloud is to select the service type.

a. Software as a Service (SaaS)
b. Platform as a Service (PaaS)
c. Infrastructure as a Service (IaaS)

Each service is built on top of the underlying cloud service model and requires the structure and standards of the services below it.

a. With **SaaS** the underlying infrastructure and platforms are provided and managed by the service provider. The provider will take care of all the software development, maintenance and upgrades. The agencies when opting for such a service will only have to pay for the number of licenses of a software on a subscription basis. Examples of SaaS are Office 365, CRM, ERP, GoToMeeting, etc.

b. **PaaS** is one level higher than IaaS which is ideal for the agencies to build applications and services over the internet with a set of tools supplied by the provider. Agencies can choose from the tools to create applications suitable for their requirement. The underlying infrastructure and the applications will be supported by the provider for the agencies. Examples are virtualization platforms, Java, MySQL services, etc.

c. For **IaaS**, the underlying infrastructure for building, or deploying any services is supplied by the provider. The agencies need to take care of the middleware, operating systems and associated licenses to build those services. Examples are Amazon Elastic Computing (AWS EC2), Rackspace dedicated storage (DAS, SAN, NAS solutions).

From the three major service models there are certain derived cloud service models which are also solutions based on the above three service models. Mentioned below are the examples of the above cloud models.

a. **With Business Process as a Service (BPaaS)** the agencies can adopt applications used for business services such as unified contact centre, time card management, which can be offered built on SaaS.

b. **Disaster Recovery as a Service (DRaaS)** is a solution where the agencies can opt for replication and hosting of services off-site (after an assessment or depending on criticality and classification of data) and within the cloud to provide a failover in the event of a man- made or natural catastrophe.

c. **Security as a Service (SECaaS)** is a solution to provide secure systems and data in the cloud as well as in traditional IT setup over the Internet. The cloud service provider will offer the agencies services like anti-virus, Identity and Access Management (IDAM) as applications in the cloud.

d. **Desktop as a Service (DaaS)** is the provisioning of the backend of a virtual desktop. The cloud service provider will manage the storage, backup, security and upgrades. While the provider handles all the back-end infrastructure costs and maintenance, agencies will have to manage their own desktop images, applications and security.

11.4.   FACTORS FOR ADOPTING A CLOUD MODEL

Before the agencies consider adopting a cloud model they will need to evaluate their requirements to understand why a particular cloud model will be suitable for them.

- For agencies opting to choose SaaS delivery model for cloud they should take the following into consideration:

  a. Agencies should choose SaaS when they want to improve the efficiency of their business related processes by being able to concentrate more on business related processes rather than processes for adoption of a software or technology, and improve the collaboration of a number of different e-services being offered.

  b. The agencies should know what exactly they want from their SaaS software services and what features the software services will need to have. For example, if the agencies want to improve collaboration between employees to reduce the time taken for an e-service then the agencies can opt for collaboration software as a service wherein employees would be on a single collaboration platform, communicate real-time and resolve any issues effectively and efficiently.

  c. Agencies should take into consideration the service level agreement which should clearly define what the SaaS provider will offer and also what consequences will they face if they fail to provide these services to the agreed standards.

  d. With SaaS the agencies will pay lower cost on the hardware and software. For example, if the agency chooses office 365 as solution in the cloud assuming that an agency has only 100 users. The agency will only pay for the 100 user licenses for an active office 365 service in the cloud, the cost for maintenance of the environment will be split between agencies.

  e. The service provider will be responsible to provide any software upgrades, security patches and the agencies will no longer need to bear costs for upgrades, reduced dependencies on technical staff to test and validate the upgrades, patches.

- PaaS as a model will be helpful for agencies if the agencies are planning to develop and deploy applications and services for cloud applications. The agencies should consider the following before choosing PaaS as a delivery model:

  a. The PaaS selection model for the agencies should depend on the application and business strategy. For example some PaaS providers offer integration with tools. High level of integration can help reduce the time for deploying applications. The agencies should also consider how an application in the PaaS environment will integrate with other applications and can share data.

b. PaaS for the agencies should provide application development, database, integration, and support and security services. Agencies should decide the need for each application in each of the mentioned services. For example if any needs redundant storage then private cloud services might be a better choice.

c. The agencies will have to decide on the type of PaaS (portable or vertically integrated) to choose from. The best options for the agencies would be to choose the open source PaaS platforms. Example of open source platforms are Cloud Foundry, OpenShift, Stackato, etc. Vertically integrated platforms seamlessly combine IaaS and Paas offerings and are not portable. These offerings can be found out typically on Azure and AWS platforms.

d. The development frameworks and languages which will be supported on PaaS. It is important for the agencies to check and determine the development languages and frameworks supported on PaaS.

e. Cost is another factor which the agencies should consider as with PaaS the agencies will need to bear the costs of developing and maintaining the applications will be the responsibility of the agencies.

- IaaS for the agencies will be ideal in delivering services on demand where network, storage and servers are available to use. The agencies should consider the following before choosing IaaS as a delivery model.

  a. IaaS will be ideal for agencies which have the need for running heavy workloads and at the same time scale resources up or down, quickly and regularly

  b. Infrastructure and data security offered by the provider meets and exceeds the standards of the agencies

  c. With IaaS, the agencies can adopt a consolidated DR infrastructure with reduced costs resulting in quick recovery without any loss of data

  d. For agencies the cost of maintaining or replacing equipment are lower. Agencies no longer will need to worry about uptime as it will be the provider responsible to maintain the uptime in case of upgrades and maintenance cycles.

The agencies should perform a cloud affinity assessment which should involve evaluating the information form against the drivers and inhibitors of cloud adoption and determine the viability of a cloud service.

Parameters	Cloud adoption inhibitors				Cloud adoption drivers		
	-3	-2	-1	0	1	2	3
Scalability							
Elasticity							
Adaptability							
Financial Strategy							
Skills							
Security							
Integration effort							
Exit strategy							
Urgency							
Project Duration							

Cloud Affinity Assessment

The above exhibit shows a scale from -3 to 3 ranging from strong inhibitors to strong drivers. If inhibitor weighting scores higher than driver weighting, then the agencies should consider avoiding certain cloud adoption patterns. For example, it is better to store and use sensitive data on a private cloud. If the opposite is true and the driver weighting scores higher, then the cloud decision process should proceed with a broader range of potential adoption patterns.

11.5. FEATURES OF CLOUD MODEL

Below are a few compelling features that will make the cloud model attractive to agencies:

a. **Flexibility:** Cloud-based services are ideal for agencies, which have fluctuating IT requirements. Whenever there is a need to scale up or down any service it can be flexibly tuned as per the requirements. This level of agility can give agencies using cloud computing a real advantage to bring up new services in a quick span of time.

b. **CapEx reduction**: Cloud computing cuts out the high cost of hardware. The agencies only pay for the utilized resources and services with the ease of tuning/scaling up servers and services within minutes.

c. **Asset utilization:** Cloud computing will promote highly efficient IT asset utilization for the agencies. It will help reduce considerable duplication of equipment and effort across agencies and departments. When they can share applications, storage, and compute power, the agencies will not have to build for peak usage.

d. **Disaster recovery (DR):** As the agencies have to process and deal with a lot of public data which maybe classified and confidential, setting up a DR is of utmost importance. For smaller agencies that lack the required funds, resources and expertise a DR solution in the cloud is more ideal than the reality. The turnaround will be quick avoiding large upfront investments with provider support available round the clock.

e. **Improved Performance:** A high performing cloud platform can support resource intensive applications and also help achieve Service Level Agreements (SLAs) for the agencies.

  i. With faster processing, agencies can run critical applications in the cloud more cost effectively and reliably with savings on CapEx and OpEx and at the same time avoid duplication of assets and improve asset utilization.
  ii. Big data, analytics, modelling and simulation can run more efficiently due to faster disk access, memory, and throughput.

f. **Automation:** Automation will enable agencies to self-provision resources (CPU, RAM, disk space, etc.) on a server which can help agencies run services efficiently with required performance and without any intervention.

g. **Improved collaboration:** All documents can be centrally stored at one location and every agency will be able to work and update documents simultaneously. Cloud will allows employees dispersed to meet virtually and easily share information in real-time leading to improved collaboration.

h. **Service and resource upgrades:** The agencies do not need to worry about applying security patches or application upgrades needed to run the business. Upgrades and patches are tested and made available to agencies by the provider after tests.

i. **Green IT:** With cloud computing, agencies can reduce the size of their own data centres - or eliminate their data centre footprint altogether. The reduction of the numbers of servers, the software cost, and the number of maintenance staff can significantly reduce IT costs without impacting the IT capabilities.

11.6. COMPARISION OF THE TRADITIONAL IT WITH CLOUD

Adopting cloud has its own benefits when compared to traditional data centre approach. Agencies may evaluate the benefits of adopting cloud over a traditional approach by carrying out feasibility assessments, cost benefit analysis, etc. The agencies need to consider the below:

a. Owning a data centre will have huge upfront investments and will require skilled manpower to manage and maintain the services hosted.

b. Other than the data centre rack and stack there is a requirement for power to keep the services up and running with a backup system in place via an alternate source.

c. Efficient cooling to keep the infrastructure up and running without hot-spots, and requirements of wiring closets.

d. Always a demand for more space with ever increasing need and demand for services.

e. Additionally the agencies will have to procure the network, server and storage infrastructure and keep them up to date with latest upgrades and patches, employ/outsource management and maintenance staff. Further, buying and building up services will require licensing costs depending upon the number of users and this cost keeps on increasing with an increase in the number of users and service capabilities. There will be costs associated with monitoring and management tools with the requirement of skilled staff to monitor and manage the availability of the services as per the RTO and RPO needs.

f. IT refresh will be another big exercise which the agencies will have to follow over a period of time as the solutions, services and products will be at end of life and OEM's will stop releasing upgrades and security patches.

The exhibit below provides a comparison of Traditional IT with cloud as a service model.

Parameter	Explanation	Traditional	Cloud
IT Monitoring / Management Efforts	Refers to the level of automation for monitoring of equipment's	High manual effort despite tools	Significantly reduced due to cloud management / monitoring tools. Enables faster ROI; Reduced Operational expenditure (OpEx)
CapEx	One time cost required to setup the data centre and IT infrastructure	Dedicated infrastructure highest cost	Capex needed to build enterprise recovery via chargeback
OpEx	Refers to the operational expenditures required over a period of time, maybe over period of 3-5 years	Higher due to no. of FTEs, power, cooling, etc.	Reduced when compared with traditional IT due to virtualization of O/S, Easier management of assets; Reduced OpEx
Utilization	Utilization refers to the amount of IT resources which are being consumed at any point of time	Typically 5-20%	Optimized (60-70% is typical). Can redeploy resources from other pool types, reducing overall infrastructure requirement. Reduced OpEx, quicker TTM, greater agility
Availability	Availability is the desired uptime of equipment and services as per agreements	Clustering can provide 99.9% but at 2 x cost	Suitable applications scale horizontally with re- startable transactions meaning 0 downtime Quicker Reduced OpEx
Elasticity	Degree to which capacity of the system can be increased or decreased as Required	Scaling up / down is a planned exercise based on procure	Scaling up / down is automatic on-demand and theoretically infinite surges in need are serviced on-demand by cloud (cloud bursts)
Scalability	Ability of a system to increase the workload on its current hardware resources	Peak load sizing at Resizing cumbersome	On-demand automatic scaling as hardware in cloud pool allocated on demand Reduced OpEx; Capacity planning for average loads reduces CapEx

Comparison of Traditional IT with Cloud

11.7. CHALLENGES AT CLOUD COMPUTING

Business and IT stakeholders perceive that agencies are most concerned about security, difficulty measuring Return on Investment (ROI) and determining the accurate economic value of the solution followed by governance of cloud-based services with respect to government and global standards.

Listed below are typical challenges from a government organisation perspective including concerns about security, integration challenges and information governance.

a. **Service quality:** Service Level Agreements (SLAs) by the providers are not stringent and adequate to assure that the services will run with the desired level of availability, performance and reliability. There are certain aspects which the agencies should keep in mind and the cloud provider should be able to answer with regards to service quality such as:

- The minimum service levels desired by an agency
- The remedies which are in place when a failure occurs
- The disaster recovery and business continuity procedures
- Portability of the agency data
- The change management process which the provider follows
- Infrastructure and security standards of the provider
- Time taken by the provider to identify and isolate problems
- Escalation process with the cloud provider
- Exit strategy with the provider including roles and responsibilities
- The process of contract termination with the provider

b. **Vendor Lock-in:** Cloud service providers will assure the agencies about their cloud being flexible to use and can easily be integrated with other providers or with in-house service capabilities, however switching providers hasn't completely evolved. Agencies may find it difficult to migrate services from one vendor to another due to interoperability and support issues between providers.

c. **Downtime and Accessibility:** The agencies will have to access the services and their data via an internet connection rather than a local connection. So when the network or internet connection is down, it will also mean that cloud services will be down. Performance of the cloud infrastructure can be affected by the load, environment and number of users. Ensuring that the cloud infrastructure is resilient to outages is vital for the agencies. While it will be almost impossible to mitigate all outages, a provider with robust and resilient measures should be chosen to protect government data.

d. **Network dependencies:** If the agencies decides to opt for a hybrid cloud integration model network dependencies will require thoughtful design involving the below parameters:

- Impact of latency (also known as time delay) between the private cloud and public cloud infrastructure
- Identifying bandwidth hungry applications that will struggle to work over wide area networks
- Bandwidth for transferring large data sets
- Using the existing IP blocks in a hybrid topology and usage of IPv6 if and when required
- Using the security appliances and solutions being used in the traditional IT / private cloud onto the public cloud.

e. **Transition to the cloud:** Transitioning to the cloud is a complex and involved process, the agencies must ensure that the proposed solution compliments their business model. There are certain aspects which the agencies should keep in mind that a cloud provider would want to know:

- The demand patterns of services for agencies
- Biggest influx of data for any agency
- Year on Year data growth for the agencies
- Constraints for agencies with the location of data
- Control over data required by the agencies
- SLA expectations of the agencies.

f. **System Management:** Lifecycle management of hybrid cloud systems can be a challenge if done incorrectly and the agencies needs to be thoroughly prepared to understand and achieve the below:

- Effective configuration management when infrastructure resources are provisioned in self-service across environments
- Achieving security and patching of multiple environments
- The nature of capacity planning changes when dealing with elastic resource pools
- Achieving Integrated and effective monitoring in the hybrid cloud.

11.8. THE RISKS AT CLOUD COMPUTING

With every adoption of technology are certain impediments which may rise from known and unknown factors. Mentioned below are risks which are associated with the adoption of cloud.

a. **Security and Privacy:** Data and information security in the cloud is usually at optimum levels, and generally reliable and proficient. Both the public and private cloud providers are compliant to various standards, however agencies maybe more reluctant to hand over important data to a third party provider as they deal with restricted and confidential data, and data in the cloud could be stored and backed-

up anywhere across the globe. A few security aspects which need to be considered by the agencies are:

- Data location in the cloud
- Security and encryption of data
- Security and governance policies of the cloud provider
- The control the agencies will have over its data and environment
- Time taken to backup an agency data in the cloud
- Data audit procedures of the provider
- Data recovery in case of data corruption
- Data extraction procedures for the agencies if the service needs to be moved in-house or to any other cloud provider.

b.   **Limited Control:** In public clouds since the cloud infrastructure is entirely owned, managed and monitored by the service provider, it may transfer minimal control over to the agencies. The agencies can only control and manage the applications, data and services operated on top of that, not the backend infrastructure itself. The agencies will have to agree with the governance, compliance and management policies of the provider.

c.   **Location of data:** Cloud computing is a borderless concept and with most providers data or a copy of the data is stored at a different geographic location other than the base location to recover from a breech or a catastrophe. The agencies need to consider the following:

- Conditions Relate to data ownership, accessibility, privacy and security.
- Decision regarding storage and transmission of data to different cloud model.
- Application sensitivity, data classification and other relevant privacy and security
- Regulatory and legal framework of the hosting jurisdiction.

d.   **Interoperability and Compatibility:** If any agency decides to move to a different cloud provider or maybe in-house there might be possibilities that the different solutions are running different infrastructure and software stacks. This poses a risk in considering whether the same change management processes be used across the hybrid cloud, or are each unique depending on the provider.

e.   **Legal regulations:** For agencies compliance with regulatory and legal standards are very important. The cloud provider and agencies are responsible to abide to legal regulations. Whenever any agency adopts and deploys a cloud model there are some issues which the agency should consider at all stages of the contractual process which are as follows:

- Initial due diligence
- Contract negotiation
- Implementation
- Termination (end of term or abnormal)
- Supplier transfer.

11.9.   ROADMAP FOR CLOUD ADOPTION

For the agencies to adopt cloud they will have to go through five phases and twenty one stages which are mentioned in the exhibit on the page below.

a.   The first phase will involve understanding cloud services from agencies business perspective and the impact of adopting cloud on existing IT.

b.   The second phase for the agencies will be the assessment of the existing IT environment with an understanding of the business processes, existing application landscape and planning for the destination with an understanding of migration scenarios, required staff and resources, support from service providers and so on to create a business case for adoption.
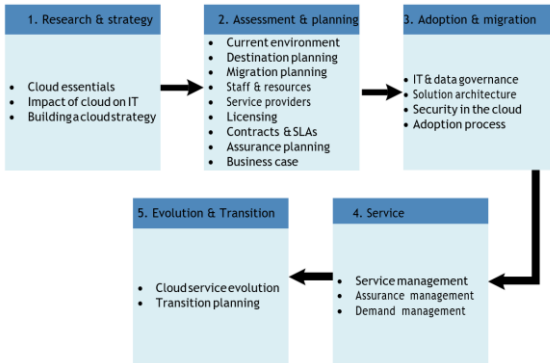
Roadmap for Cloud Adoption

c.   The adoption and migration stage will involve defining the IT and data governance architectures, and policies with solution architectures and defining and understanding the security in the cloud.

d.   The next phase is the service management where the agencies should work with the provider to manage the assured SLAs of the agencies. At any time the agencies might have a requirement for additional resources and as cloud is focused on availability of on-demand resources. For any compromise or failure in service delivery the provider should have set mechanisms to inform and update the agencies about the nature of failure and the impact.

e.   Cloud as a service has evolved over the years and the agencies should work with the provider to understand how the provider cloud has and will evolve for processes and technologies as per the requirements of the agencies and compliances. Once this is clearly documented the agencies and the providers should work towards the migration of services.

CHAPTER 12

12. VUCA

"The most the time you need to be in the middle,
is when you want to be seen the less."

12.1. GENERAL VİEW

VUCA is an acronym for Volatility, Uncertainty, Complexity and Ambiguity. It is an abbreviation that stands for variability, complexity and uncertainty, which is a combination of qualities that characterize the nature of certain difficult conditions and situations. The term can also be explained by other adjectives: volatile, complex, and ambiguous.[4]

Variability is the quality of exposure to frequent, rapid and significant change. For example, raw material prices may be increased/reduced significantly in a short period of time and the direction of a tendency may suddenly reverse in a volatile market.

Uncertainty is a component of this situation where matters and consequences are unpredictable. Complexity involves a multitude of issues and factors, some of which may be intricately interconnected. Indefinableness involves situations where a clear, unambiguous statement cannot be made. VUCA also emerges as a chaotic concept. It is manifested itself by uncertainty, lack of clarity, and difficulty understanding exactly what the situation is.

The concept of VUCA originated from the United States Army War College to describe conditions stemming from the Cold War. VUCA as a terminology has been adopted in many sectors, institutions and organizations in the sector to guide leadership and strategy planning. Awareness of the forces represented in the VUCA model and the strategies to mitigate the harm they can cause is an integral part of crisis management, contingency plans and disaster recovery planning.

The world of VUCA may have created challenges for some businesses, but it has also allowed entrepreneurial and innovative companies to turn crisis into opportunity. In

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[4] https://whatis.techtarget.com/definition/VUCA-volatility-uncertainty-complexity-and-ambiguity

this period, companies that attach importance to agility and cooperation can adapt to the VUCA world more easily.

Strategic decisions to be taken in the VUCA world bring along a series of coordinated actions with the formation of a collective consciousness. Globalization has placed a significant pressure on leadership and entrepreneurship on an institutional or organizational basis; quick decision making, preserving the culture of the institution or organization, their ability to adapt to differences and fostering rapid collaborative innovation.

12.1.1. VOLATILITY

Rapid change in the absence of a clear and predictable tendency. It represents the rate of change in the market, industry or worldwide. The difficulties encountered usually arise unexpectedly and their duration is unknown. It requires anticipating and reacting to the nature and speed of change. Risks and imbalances create the need to adopt approaches that require vision. The presence of competencies such as future orientation, transparency, open communication and belief in a better future are the most important competencies in predicting variability.

12.1.2. UNCERTAINTY

It represents frequently encountered and understood, unpredictable changes and results. It represents frequently encountered and understood, unpredictable changes and unpredictable results. These volatile times make it difficult to use past problems and events as predictions of future outcomes, making forecasting and decision making extremely difficult. Data overload can cause loss of direction. To minimize the effects of uncertainty; it requires a clear direction, determination in action even if there is not certainty, and a review of alternative plans. It is important for institutions or organizations to establish a solid foundation of loyalty, flexibility, cooperation and diversity in values.

12.1.3. COMPLEXITY

Interconnected causes and effects express complexity. Managing complexity and chaos is the most effective action. "Clarity" should be defined by the restructuring process by institutions or organizations. Data analysis requires effective communication, decision making, clarity and transparency.

12.1.4. AMBIGUITY

Lack of clarity about the meaning of an event or answers to questions such as reasons, "who", "what", "where", "how" and "why" behind things that happen represent vague and difficult to understand. Indefinability in the VUCA model is often described as "the inability to properly conceptualize threats and opportunities before they become deadly." It leads to a loss of clarity and divergent interpretations of "truth" and "right". Doubt, delayed decisions, hesitancy to change, innovation, and

continuous improvement "Agility" should be adopted as a strategy, institutions or organizations should be determined to maintain their effectiveness even if surprises become permanent. A structure that requires reliability, determination, innovative thinking, belief in change, and technology-oriented should be created.

12.2. VUCA ENVIRONMENT REQUIREMENTS

12.2.1. VISION
Volatility improves vision. What needs to be done to develop a vision;

- Requires regular vision sharing.
- It should contain the principle of transparency.
- Making the vision meaningful for the employees and creating a set of values,

VISION

- Confidence environment: Identifying and mastering needs so that people feel safe, knowledgeable and helpful,
- Defining job protocols, job descriptions and expectations,

- Teamwork: Togetherness requires cooperation. "Any of us are smarter than each other"
- Goals and performance criteria should be aligned with the vision.

12.2.2. PERCEPTION
It is necessary to follow innovations, competitor analysis, know the state of meeting customer (service provided) expectations, predict possible scenarios, be prepared for this and meet possible reactions. Crisis Management, Game Theory and the use of simulated scenarios will provide "understanding".

PERCEPTION

12.2.3. CLARITY

CLARITY

Analyzing and identifying priorities and drawing up a simple but functional plan will help provide "clarity". A balance must be struck between urgency and importance, and between priorities. It is important to be able to plan according to the purpose, to decide whether the plan will be for today or for the future. Team leaders in your team should be identified and the plans should be known by the entire institution or organization.

12.2.4. AGILITY

It should be aimed to create a learning organizational structure and to create a team that takes part in the decisions instead of top-down decisions. It requires an innovative and innovative vision. "Awareness" should be created with the awareness that pre-made plans will not work. It requires communication across the institution or organization's practitioners

AGILITY

and all ecosystems. Solutions should be created by establishing a balance between standard operations and innovative approaches. It is important that the goals are adopted by the teams.

12.3. TAKE ADVANTAGE OF UNCERTAINTY TO THE OPPORTUNITY

According to Wheatley, he emphasized that the most frightening situation emerges as a result of uncertainty, complexity and fluctuations in organizations, that the sources of creativity are determined with the emergence of this, and that development occurs not with balance, but when balance decreases or disappears. He suggested that in these and similar uncertain conditions, leaders' not being afraid, considering these situations as data to identify opportunities, can be considered as determining factors in the development of innovative and creative approaches.[5]

The VUCA environment also enables leaders to identify the shortcomings of institutions or organizations and to see points that can be ignored or unpredictable in managerial processes. It is considered as an opportunity for institutions or organizations to see and realize system failures and to see the necessity of strengthening the system. In the VUCA environment, where the traditional leadership approach is inadequate, the importance of "leadership from the heart" is a learning process in terms of re-evaluation, revision, elimination of system blindness, the opportunity to change the "game" and sailing to the new beginnings.

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[5] Wheatley, M. J. (1992). Leadership and the new science: learning about organizations from an orderly universe. San Francisco: Berrett-Koehler.

CHAPTER 13

13. ARTIFICIAL INTELLEGENCE

13.1. OVERVIEW

The term called "Artificial Intelligence" means the ability of a computer or a computer-controlled robot to perform various activities similar to intelligent creatures in the literature. In other words, Artificial intelligence makes the computer think like humans. It helps machines solve complex problems in a human-like way.

Computers can do some simple functions better than human intelligence; They can perform math calculations, process numbers and letters, make simple decisions, and execute various information storage and retrieval functions. Computers are pretty good in such applications and often get ahead of humans.

The purpose of artificial intelligence is to build machines that can perform tasks that typically require human intelligence. Because even computers used in homes multiply the multiplication of two 5-6-digit numbers at the nanoseconds level, or it immediately deducts how many a certain word is in a book, far below human perception. Artificial intelligence allows us to expand the complex operations performed manually with technology applications or automatically. In addition, artificial intelligence technologies are integrated with other computer-based information systems, increasing computers' capabilities and applicability.

- **Symbolic Artificial Intelligence**

The developed programs had a horrible success because they were developed not with real problems but with symbolical issues. The main reason was that these programs failed in making sense, making connections, and executing ideas by simulating only syntactic processes. These inadequacies were, in fact, due to the preliminary study of semantic methods in the human brain.

- **Cybernetic Artificial Intelligence**

The situation was the same on the cybernetic front, where artificial neural network studies were involved. Many researchers have halted their studies, revealing some critical deficiencies in these studies' basic structures to simulate intelligent behaviour. The main reason for the failure of the cybernetic trend is similarly that the Artificial Neural Network accomplishes the single-layered task, but the conclusions about this task are transformed into judgments and cannot be associated with other concepts. This also led to the fact that semantic processes cannot be simulated either.

- **Artificial Intelligence with expert systems**

The failures of both currents led to the development of using programs equipped with knowledge in a particular area of expertise instead of general-purpose systems to solve every problem, which led to a revival in the field of artificial intelligence. Expert systems are based on applying a program to incoming problems, which includes all of the rules that determine what decision an expert (sometimes with what probability) will make when certain preconditions exist simultaneously. One advantage of this was that it was easy to know which rules were applied to each decision.

13.2. ARTIFICIAL INTELLIGENCE AND NATURAL INTELLIGENCE COMPARISON

The potential value and future horizons of artificial intelligence can be perceived more clearly by comparing artificial intelligence with natural intelligence in some areas.

- Artificial intelligence is permanent: Natural intelligence can change as employees move over time, or people with natural intelligence may forget their knowledge. On the other hand, artificial intelligence is permanent and does not disappear as long as computer systems and programs do not change.

- Artificial Intelligence can be easily copied and broadcast to the broader audience: When it comes to natural intelligence, transferring a skill from one person to another requires a long apprenticeship period. Even if this is provided, expertise cannot be transferred to the other person completely. But if the information is introduced into a computer system, it can easily be copied from one computer to another, and its scope of use can be expanded.

- Artificial Intelligence can be obtained cheaper than natural intelligence: In many areas, computers' purchase and use can be provided much more affordable in most areas than human training and service.

- Artificial Intelligence is entirely consistent with computer technology, there is no inconsistency: In contrast, natural intelligence is unstable, unstable, and disorganized. This is due to the nature of the human being who possesses natural intelligence.

- Artificial Intelligence can be documented: The system's activities can easily verify decisions made by the computer. Natural intelligence is challenging to reproduce. For example, a person cannot decide after a certain period of time; He may not remember how he reached this decision and from which assumptions he set out.

- Despite all this, there are situations and areas where natural intelligence is superior to artificial intelligence. We can show them the following examples:
    - Natural intelligence is creative and fertile. On the other hand, there is no creativity and fertility in artificial intelligence: While the ability to acquire information is a natural state of human's natural intelligence, information in artificial intelligence must be carefully embedded in the system.
    - Natural intelligence provides people with the ability to use and benefit from experiences learned through their senses: In contrast, most artificial intelligence systems work with symbolic input.
    - The most important advantage of natural intelligence is human judgment's ability to use extensive experience to solve problems immediately, according to the issue encountered: Artificial intelligence systems are doomed to use the relatively narrow solution methods provided to them.

13.3.   NEAR FUTURE OF ARTIFICIAL INTELLIGENCE AND AREAS OF USES

- **Entertainment:** You can order a special movie featuring virtual actors of your choice while sitting on your sofa in the future. Also, advanced prediction programs can estimate the box office potential while analyzing a movie script's story.

- **Medicine:** AI algorithms will enable doctors and hospitals to better analyze data and tailor healthcare to each patient's genes, environment and lifestyle. AI will drive the personalized medicine revolution from diagnosing brain tumours to deciding which cancer treatment will be best for an individual.

- **Cybersecurity:** Companies struggle to stay one step ahead of hackers. USC experts say that AI's self-learning and automation capabilities can protect data more systematically and affordably, keeping people more secure from terrorism or smaller-scale identity theft.

- **Vital Tasks:** AI assistants will help people whose age needs someone's help to stay independent and live longer in their own homes. Artificial intelligence tools; It will keep nutritious food readily available, safely reach objects on high shelves, and monitor people's movements in their home.

- **Transportation:** The point where AI can significantly impact the near future is in cars. Unlike humans, AI drivers never look at the radio or argue with their children in the back seat. Thanks to Google, the use of autonomous vehicles today is expected to increase by 2030.

- **Artificial Intelligence and Tourism:** Artificial Intelligence and Tourism virtual assistants, specially developed for tourism and cultural protection zones, meet tourists' expectations by increasing visitor satisfaction from the beginning to the end of visits, entertainment, travel, events and similar holiday actions. Thus, people can receive up-to-date information about visiting points such as artifacts, restaurants, services and events belonging to the relevant touristic region, or watch relevant promotional videos and reach every moment they want to go within the touristic scope areas with navigation guidance.

- **Artificial Intelligence and Customer Service:** Thanks to the Artificial Intelligence and Customer Service experience, users can get information about available products and online technical assistance and even make a technical service appointment. Artificial Intelligence Intelligent Customer Assistants can be activated by voice or text by imitating human intelligence and natural speech. When they communicate with you via the voice command system, they can interpret your voice and provide consultancy services appropriate to your questions.

- **Artificial Intelligence and Airport:** With the Artificial Intelligence Airport experience, users can learn the flights from the starting point to the destination point together with their prices, they can monitor their current flight status using the flight number and reach the fact they want to go within the airport with indoor navigation guidance.

- **Artificial Intelligence and Smart Cities:** Artificial Intelligence and Smart Cities technologies, which enable municipal services to be carried out more efficiently with less cost, allow more effective services to be provided to citizens. While smart cities add value to human life, they also improve the quality of life. Smart city applications started to be used in many municipalities; It focuses more on the environment, transportation, governance, security, health and geographic information systems.

- **Artificial Intelligence and E-commerce:** Artificial Intelligence technologies are used to customize search consoles on E-commerce sites. Artificial intelligence brings together information such as customers' shopping habits and interests and enables them to provide personalized product recommendations to consumers. In this way, users are directed to the website. Artificial intelligence is used in the e-commerce industry to offer different discounts to different customers or show different products to different customers.

- **Artificial Intelligence and Activities:** Artificial Intelligence and Activity Assistants enable users to receive up-to-date information on events, movies, and more, or to watch promotional videos on the subject. In addition to this; It offers the opportunity to examine whether and traffic details, check promotions in cafes and stores, and learn about current campaigns.

- **Artificial Intelligence and Banking and Financial Services:** Artificial Intelligence and Banking and Financial Services experience assist investors in many issues, from account transactions to stock proposals, by increasing users' work efficiency. For you to use the time allocated for stock tracking, trading process, fund tracking and similar processes more effectively; It enables you to receive information about user account information, credit information, updates, investment reports and more, and controls this process.

- **Artificial Intelligence and Education:** Since Artificial Intelligence and Educational technologies can analyze the students' missing areas, they can design the program in accordance with the individual. It is predicted that students will be more productive and will add value to their environment as an individual who loves their job in the future with a personalized training program. Artificial intelligence, which personalizes educational software according to student needs, better understands individuals who love and create a personalized support advantage for development. Intelligent data collection supported by smart computer systems is a process actively applied by many schools today. Today, some schools use artificial intelligence technology to follow students' development process and increase the students' performance with this analysis.

13.4. THE FUTURE OF ARTIFICIAL INTELLIGENCE

- 72 percent of business leaders say AI will gain an advantage.
- By 2020, 1 billion video cameras are expected to be connected to artificial intelligence.
- The 4 billion devices currently in use include AI audio features.
- 2.3 million new jobs were created thanks to AI, while 1.8 million jobs were eliminated by 2020.
- In 2021, artificial intelligence enhancement will create 2.9 trillion dollars of business value, and 6.2 billion hours of employee productivity will be recovered.
- In 2014, 300 million dollars of venture capital investment was made in artificial intelligence initiatives. This figure increased 300 percent compared to the previous year.
- Participants in the 2017 study by Redwood Software and Sapio Research said that they believe 60 percent of businesses could be automated within the next five years. On the other hand, Gartner predicts that AI will generate more work by 2020. In addition to creating new jobs, AI will also help people do their jobs better.

13.5. TARGETS

People; Scientists are doing more research in the field of artificial intelligence, as they have small capabilities, limited storage brains, and a limited lifespan. Imagine a mind

that can read thousands of books per second. What would the result be if it could not only read but also understand, perceive and analyze it by making a new connection and reasoning between different fields of science?

The medical industry leap can cure all chronic diseases and prolong human life. Discovery of other universes and the technical progress in all sectors; It will help companies better plan their operations and understand them, thereby increasing revenue and customer satisfaction and reducing costs.

CHAPTER 14

14. AUGMENTED REALITY

14.1. OVERVIEW

As the IT Governance Turkey Team, We will convey information about Augmented Reality (AR) developing rapidly in our country as well as rest of the world without going into details. AR is the combination of digital images (animation, 3D objects etc.) with a live camera to create the illusion of digital objects existing in the physical world. For instance, you go shopping or a grocery store but you don't know much about the store or market. Using the camera on our smart devices in the store, imagine you can see and read information about the store, discounts and campaigns, announcements, analyzes, etc.

14.2. WHAT IS THE WORKING LOGIC BEHIND AR?

Camera analyzes data in the physical world and transfers it to a virtual server then AR creates another level of realism to transfer the experience. Thus, we feel ourselves in the virtual world. There are two main methods to set up AR:

1. **Unmarked Tracking:** Unmarked technology uses special scanning algorithms. A virtual "background" is projected onto the image captured by your camera. Automatic analysis finds various points to pinpoint the location or transfer them to a virtual model. The most substantial advantage of the unsigned technology is that the principal object can be used as a pointer. So, you don't have to create unique visual descriptors. Hope that it's crystal clear.

2. **Marker-Based** Technology: Another working logic is marker-based technology which provides simpler detection by the markers and the camera. In addition, with markers, you get more images linked to a specific point. Also, AR systems or applications can be designed to identify all kinds of markers.

14.3. HOW WILL AR IMPACT OUR LIVES?

We know that augmented reality is used as an important training method in an avocational manner. Furthermore, for schools, it is also very important that students understand their knowledge in practice first hand. Most students learn better by doing and practicing instead of listening to lectures, and virtual reality provides them with the opportunity to gain practicality that traditional education programs cannot provide, and with this opportunity, it is a candidate technology to create a new era in

education. It is also very important that students practically understand first-hand knowledge.

14.4. APPLICATION AREAS

Most of the industries are experiencing the adoption of Augmented Reality including education, healthcare, sports, real estate, media and entertainment and many more. It has a related complex structure as well as wide range from a simple game to sophisticated surgical applications.

14.4.1. THE USE OF AR IN MANUFACTURING

AR has created many innovations and opportunities in the field of industries. Main objectives of AR in the industry are productivity, product quality, cost reduction, quality improvement and profit. AR is used to show industrial products, conduct market research and gather ideas. By bring even more novelty in the near future, its use is increasing in order to increase productivity rates.

14.4.2. THE USE OF AR IN MARKETING

AR, opened a new era in the marketing industry, increases sales and extremely popular in marketing. AR, opened a new era in the marketing industry, increases sales and extremely popular in marketing. Marketing experts are able to impress their customers with the flashy presentation by using AR. The technology becomes popular and it is clear that there will be great innovations in the near future.

14.4.3. THE USE OF AR IN REAL ESTATE

Breakthrough in marketing, AR has shown the same impact in the real estate industry. AR provides an unique experience to the potential buyers. Using AR, real estate developer and agents could show the property in 3D before making the effort to travel there. It is obvious that AR will open a new era in the near future for real estate sector.

14.4.4. THE USE OF AR IN MEDIA AND ENTERTAINMENT

AR is gaining popularity and becomes a very promising trend to offer exciting futures. Musicians and filmmakers use AR to add extra elements to demonstrate the effects. In contrast with traditional filmmaking using a green screen, in AR, pre-rendered computer-generated avatars are filmed walking around an area. To give an example, the most well-known AR game is Pokemon Go.

14.4.5. THE USE OF AR IN SALES

When people buy a good, they sometimes feel pessimistic which inevitably affects the businesses. However, AR provides a positive effect for both buyers and business. With AR, before we buy a good for our home, we can virtually overlay, move, rotate and change color in a live camera to see how it will fit and look in real time. To give an example, Ikea, world's largest furniture retailer, launched an AR application that allows users to test IKEA's products in real time through smart phone.

14.5. VIRTUAL REALITY VS AUGMENTED REALITY

Virtual Reality and Augmented Reality are completely different concepts. Augmented reality (AR) adds digital elements to a live view. You will see virtual elements merging with the real world in the fictional world. Virtual reality (VR) creates a complete immersive virtual environment which is isolated from the real world. AR is 25% virtual and 75% real while VR is 75% virtual and 25% real. No headset is needed in AR while VR requires a headset device.

14.6. AUGMENTED REALITY IN TURKEY

Academic studies are carried out on augmented reality technology in Turkey and there are competent companies developing AR applications. AR applications are widely used in Turkey. To give an example, Marshall Boya allows users to observe the wall color via Visualizer AP application without being painted. Fenerbahçe Sports Team allows its supporters to use AR application on Fenerbahçe t-shirts to take a place in the championship pose of Fenerbahçe. Sakıp Sabancı Museum allows visitors to see the figures interactively and provide translation services.

14.7. AUGMENTED REALITY COMPANIES IN TURKEY

- **ARPandora**

Pandora initially focused on architectural applications.

- **Hangaar Lab**

It focuses corporate businesses targeting Medical and defense industry.

- **Arox Bilişim**

It is a software company that provides digital solutions. Developed Sakıp Sabancı Museum AR Project.

- **Vizera Lab**

It offers an extraordinary shopping experience to its users with offices in San Francisco, Paris and Ankara.

14.8. AR APPLICATION EXAMPLES

- **MondlyAR**

As a foreign language teaching platform, Mondly has created an AR application that can help you learn new language and allow you to test your speaking skills with personal language assistant. This language assistant can speak in six different languages. MondlyAR's advanced features: Voice recognition, chatbot technology and artificial intelligence.

- **Inkhunter**

It is a very useful application for those who want to get a tattoo. Inkhunter can help you make more casual tattoo decisions.

- **Star Chart**

If are interest in astronomy and space, this application is for you. With this application, you can detect any celestial body, constellation or planet in the solar system. The app will automatically track your movement, draw the sky, and teach you some interesting facts about space.

- **Holo**

It allows you to embed augmented reality images in photos and videos. Holo's augmented reality visual effects or holograms consist of celebrities and famous fictional characters.

- **Euclidean Lands**

It is a puzzle game in which you need to move your character on a complex 3D structure, killing enemies and avoid getting kills as you move towards the exit point. It's a very challenging game that will make you think well before making a step.

14.9. FUTURE OF AUGMENTED REALITY

Augmented reality technology has seen unprecedented growth in 2020 due to use by market leaders like Microsoft, Apple, Google, Facebook, and Amazon. According to MarketsandMarkets, the market for AR technology is worth $15.3 billion. It's worth

exploring the different avenues and trends that drive the surging augmented reality market. By the end of 2020, AR active devices were estimated to rise to 598 million units and are projected to grow to 1.73 billion by 2024.

So, what will happen next? AR will continue to serve different purposes and offer different value propositions. AR will be more usable in daily life within a few years of our lives. One day, maybe, mirrors or walls will turn into AR applications.

AR will open a new era in the world and as the IT Governance Turkey family, we took our place so should you.

CHAPTER 15

15. INTERNET of THINGS (IoT)

15.1. INTRODUCTION

The Internet of Things (IoT) is a communication network where physical objects connect with each other and exchange data. Objects within the communication network in question are marked with a unique identifier. The biggest problem with the act of marking with a unique identifier is that the IP addresses commonly used today for this marking are limited. It is believed that this problem on the Internet of Things will be overcome with the use of IPv6.

In IoT, every unit in the network does not have to be interconnected. In principle, each unit of the communication network works together to exhibit a greater value than it is currently capable of.

Thanks to the IoT, smart devices stay in touch with each other and maximize the user experience by collecting data from users. This collected data is processed for the singular functions of things in the network and within the purpose of the entire system that these things create.

In line with the development purposes of the products, they can benefit from many ready data and the data collected with the product usage. Considering the size of the total data probability that will be revealed, it should also be considered that IoT technologies are largely related to Big Data Technology.

Each element in the communication network must be able to use a transfer protocol to exchange data. Objects¬\things that do not have a receiver or transmitter function can be affected by the results of this network, but the communication in question cannot be located inside the network.

For a thing to exchange data and qualify as "smart", the object must have a unique identifier, be connected, and have a sensor that can perform the receiver or transmitter operation. These smart objects can be located within the IoT communication network and can be affected by the results of this network.

15.2. IOT APPLICATION EXAMPLES

We can give many examples of the uses of the IoT such as health, smart home systems, smart agriculture, smart environment, smart energy, smart animal husbandry, smart metrics, smart cities, industrial controls, security and emergencies, logistics and shopping. The technology in question collects and processes the data it collects in order to provide better quality service in these areas. This technology, for now, is often used to produce products that conduct inspection and inspection, although there are products with different working purposes.

IoT is now one of the technologies that users can easily access. Besides, the preferences of the end user are now becoming important in sectors where the Internet of Things is used. Smart home systems are one of the best examples of these. Smart home adjusts the internal temperature of the house according to the user's distance to the house, opens or closes curtains according to the clock, plays songs from your sound system according to your request... In short, it is a technology that almost completely automates your home.

Today, even global giant technology companies such as Amazon, Samsung, LG are developing products within the framework of the Internet of things. Smart home systems and wearable smart devices are the product categories in which these companies make the most improvements in the IoT field.

We can also make our own device that can connect. For this, we need an I / O (Input Output) card and a platform where the software of this card can be written. Arduinos are the most widely used products of this technology today.

Arduino I/O cards usually have a microcontroller and side elements to ensure its connection to programming and other circuits. Each card has a regulation integrated and a crystal oscillator. Depending on the type of I/O cards, we can connect these cards directly to the computer with or without FTDI and write their encoding through the Arduino developer.

Before coding, it is necessary to find out what the units of the system we want to reveal need one by one and learn with which modules these needs can be met. For example, a lighting system working with sound level, a sound module and light source will be required in addition to the I / O card.

After selecting the necessary modules according to our needs, it is necessary to install an electrical circuit, connect the necessary cards and modules together. After this process, encodings can be performed by connecting the I/O card to the computer.

In Figure, you can see how the Arduino I/O card and several modules are connected via breadboard.

Arduino I/O card sample
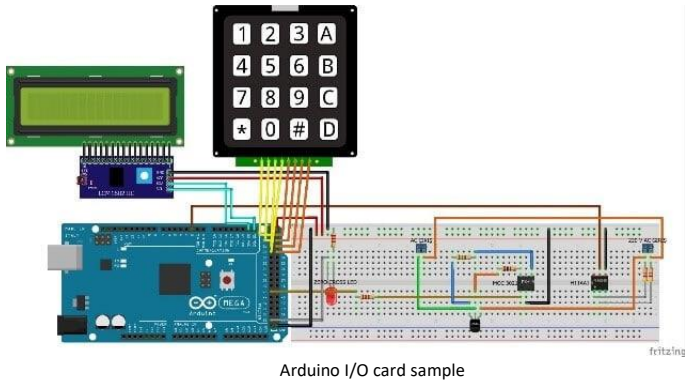
It can be developed with Arduino, as well as IoT products with I/O cards and modules such as Raspberry Pi, mRobot. Developed products can then be connected to each other and work in a system.

One of the biggest consequences of the fact that things can communicate with each other is that a new communication channel has emerged. Human to machine and machine to human communication is a channel of communication that we are usually used to. But thanks to the Internet of things, a new communication channel has also been opened in the form of machine to machine.

15.3.   FUTURE OF IOT

With the emergence of a machine to machine communication channel, the path to the existence of objects that give commands to each other, receive commands from each other, and synthesize received or given commands and process the results using artificial intelligence technologies has been opened.

It is estimated that about 70 billion objects are in contact with each other today. We can say that the data collected by these objects is useful in the development of artificial intelligence and Big Data Technologies.

REFERENCES:

- The World Bank Report: Sub-Sharan Afric: From Crisis to Sustainable Growth

- White Paper on European Governance

- Doç Dr. Murat OKÇU - Değişen Dünyayı Anlamak İçin Önemli Bir Kavram: Yönetişim

- Fikret TOKSÖZ - İyi Yönetişim El Kitabı

- SSRN Good Governance – Concept, Meanning and Features – A Detailed Study

- PM World Journal - The six functions of governance

- IT Governance – Board Biefing on IT Governance

- Aasi, P., Rusu, L., & Vieru, D. (2017). The role of culture in IT governance five focus areas: A literature review. *International Journal of IT/Business Alignment and Governance (IJITBAG)*, *8*(2), 42-61.

- Abrahamsson, P., Salo, O., Ronkainen, J., & Warsta, J. (2017). Agile software development methods: Review and analysis. *arXiv preprint arXiv:1709.08439*. http://www.agilemanifesto.org

- Cockburn, A. (2000). Agile software development draft version: 3b. *Highsmith Series Editors*.

- Dyba, T., & Dingsoyr, T. (2009). What do we know about agile software development?. *IEEE software*, *26*(5), 6-9.

- Highsmith, J., & Cockburn, A. (2001). Agile software development: The business of innovation. *Computer*, *34*(9), 120-127.

- Kruchten, P. (2013). Contextualizing agile software development. *Journal of software: Evolution and Process*, *25*(4), 351-361.

- Laanti, M., Similä, J., & Abrahamsson, P. (2013, June). Definitions of agile software development and agility. In *European Conference on Software Process Improvement* (pp. 247-258). Springer, Berlin, Heidelberg.

- Misra, S. C., Kumar, V., & Kumar, U. (2009). Identifying some important success factors in adopting agile software development practices. *Journal of Systems and Software*, *82*(11), 1869-1890.

- Williams, L., & Cockburn, A. (2003). Agile software development: it's about feedback and change. *IEEE computer*, *36*(6), 39-43.

- https://www.tutorialspoint.com/sdlc/sdlc_waterfall_model.htm

- https://wadic.net/waterfall-model-advantages-disadvantages/

- http://tryqa.com/what-is-waterfall-model-advantages-disadvantages-and-when-to-use-it/

- https://binaryterms.com/waterfall-process-model.html

- https://leanmethods.com/resources/articles/what-is-lean/

- https://www.processexcellencenetwork.com/lean-six-sigma-business-performance/articles/what-is-lean

- https://kanbanize.com/lean-management/what-is-lean-management

- YALIN YÖNETİM ANLAYIŞININ ÇALIŞANLARIN MOTİVASYONUNA VE HİZMET KALİTESİNE ETKİLERİNE YÖNELİK BİR ARAŞTIRMA - Hamdi AYDIN

- https://blog.kainexus.com/the-fundamentals-of-the-lean-methodology

- https://theleanway.net/The-Five-Principles-of-Lean

- https://kanbanzone.com/2019/lean-management/

- Alvarado-Ramírez, K. M., Pumisacho-Álvaro, V. H., Miguel-Davila, J. Á., & Barraza, M. F. S. (2018). Kaizen, a continuous improvement practice in organizations. *The TQM Journal*.

- Macpherson, W. G., Lockhart, J. C., Kavan, H., & Iaquinto, A. L. (2015). Kaizen: a Japanese philosophy and system for business excellence. *Journal of Business Strategy*.

- Murata, K., & Katayama, H. (2010). Development of Kaizen case-base for effective technology transfer–a case of visual management technology. *International Journal of Production Research*, *48*(16), 4901-4917.

- Otsuka, K., Jin, K., & Sonobe, T. (2018). *Applying the Kaizen in Africa: A new avenue for industrial development*, Springer Nature, 266.

- Singh, J., & Singh, H. (2009). Kaizen philosophy: a review of literature. *IUP journal of operations management*, *8*(2), 51.

- Styhre, A. (2001). Kaizen, ethics, and care of the operations: Management after empowerment. *Journal of Management Studies*, *38*(6), 795-810.

- *Arzu ŞEKER, Yalın Üretim Sisteminde Kanban, Tek Parça Akışı ve U Tipi Yerleştirme Sistemleri, Batman Üniversitesi, Ekim.2016)*

- Ulaş Bağcı, Kanban Sistem Tasarımı ve Otomotiv Sektöründe Bir uygulama, Yüksek Lisans Tezi, İstanbul Teknik Üniversitesi, Ekim 2006

- Jeff Sutherland, İki katı işi yarı zamanda yapma sanatı, çev. Ali Atav (Ankara: Buzdağı Yayınevi, 2019),

- Takeuchi, Hirotaka ve Nonaka, Ikujiro, "The New New Product Development Game." Harvard Business Review (Ocak-Şubat 1986).

- Jeff Sutherland ve Ken Schwaber, The Scrum Guide. (November 2017),

- Caulcutt, R. (2001). Why is Six Sigma so successful?. Journal of Applied Statistics, 28(3-4), 301-306.

- Eckes, G. (2002). The Six Sigma revolution: How General Electric and others turned process into profits. John Wiley & Sons.

- Kwak, Y. H., & Anbari, F. T. (2006). Benefits, obstacles, and future of six sigma approach. Technovation, 26(5-6), 708-715.

- Pepper, M. P., & Spedding, T. A. (2010). The evolution of lean Six Sigma. The International Journal of Quality & Reliability Management, 27(2), 138.

- Seow, C., Goh, T. N., & Xie, M. (2004). Improving on the Six Sigma paradigm. The TQM Magazine.

- Thawani, S. (2004). Six sigma—strategy for organizational excellence. Total Quality Management & Business Excellence, 15(5-6), 655-664.

- Zink, K. J. (2012). Total Quality Management as a holistic management concept: the European model for business excellence. Springer Science & Business Media.

- ISACA History Overview. Retrieved 11.10.2020 https://www.isaca.org/why-isaca/about-us/history.

- The ISACA Timeline. Retrieved 11.10.2020 https://www.isaca.org/why-isaca/about-us/isaca-50/timeline.

- Tessin P.(2016). COBIT Celebrates 20 Years of Guidance https://www.isaca.org/resources/news-and-trends/isaca-now-blog/2016/cobit-celebrates-20-years-of-guidance.

- COBIT Control Objectives for Information and Related Technology 4.1.(2007).IT Governance Institute, ISACA. https://www.isaca.org/bookstore/bookstore-cobit-digital/wcb4_1

- COBIT5 A Business Framework for the Governance and Management of Enterprise IT.(2012).ISACA. https://www.isaca.org/bookstore/cobit-5/wcb5.

- BDDK, (2010). Bağımsız Denetim Kuruluşlarınca Gerçekleştirilecek Banka Bilgi Sistemleri ve Bankacılık Süreçlerinin Denetimi Hakkında Yönetmelik. Resmî Gazete. Sayı: 27461, Tarih: 13.01.2010.

- COBIT 2019 Framework, Governance and Management Objectives (2018). ISACA. https://www.isaca.org/bookstore/bookstore-cobit_19-digital/wcb19fgm

- ITIL Foundation ITIL-4 Edition - Axelos

- https://info.axiossystems.com/blog/what-are-the-four-dimensions-of-itil-4#:~:text=The%20four%20dimensions%20of%20ITIL%204%20are%20an%20evolution%20of,Products%2C%20Processes%2C%20Partners).

- https://www.beyond20.com/itil-4-complete-guide/

- https://www.knowledgehut.com/tutorials/itil4-tutorial/service-value-chain-model

- https://www.bmc.com/blogs/itil-4/

- Umman Government - GS_F2_Cloud_Governance

- https://whatis.techtarget.com/definition/VUCA-volatility-uncertainty-complexity-and-ambiguity

- Wheatley, M. J. (1992). Leadership and the new science: learning about organizations from an orderly universe. San Francisco: Berrett-Koehler.

- https://tr.wikipedia.org/wiki/Yapay_zek%C3%A2

- https://web.itu.edu.tr/~sonmez/lisans/ai/yapay_zeka_icerik1_1.6.pdf

- https://www.yapayzekatr.com/2020/01/06/yapay-zeka-ve-kullanim-alanlari/

IT GOVERNANCE TURKEY

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The challanges in the market make it necessary for the organizations to change. Methodologies and frameworks used in management techniques provide standardized and adaptable general methods and approaches in organizations.

In this context, this book, prepared by IT Governance Turkey, has been prepared to be a guide for today's business world. It provides knowledge to managers, business professionals, researchers and students.

HANDBOOK CHAPTERS

Governance, IT Governance, Agile, Waterfall, Kaizen, Kanban, Lean, Six Sigma, Scrum, COBIT, ITIL, Cloud Computing, VUCA, Artificial Intelligence, Augmented Reality, Internet of Things

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