Leadership Role in Project Management When Implementing the 4th Industrial Revolution Requirements

دور القيادة في إدارة المشاريع عند تنفيذ متطلبات الثورة الصناعية الرابعة

by

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ABSTRACT

This research discusses the changes that occurred as a result of the 4th industrial revolution and how it is impacting the project management profession, with a highlight on leadership role in implementing the 4th industrial revolution requirements. This research paper provides a framework illustrating the relationship between the 4th industrial revolution and the leadership skills that a project manager needs to take into account.

This research is important because it discusses today's world and the developments we witness, with focus on the project management field. Also, it highlights one of the most important factors that contributes to this evolution which is leadership.

This work attempts to provide an integrated framework and recommendations to avoid the 4th industrial revolution's negative impacts in the project management field that could be in the form of fewer job opportunities or the inability of the staff to keep up with the technological changes. As this research tries to make the best out of these advancements and developments by engaging leadership to better serve the people and the project management field while taking into account the 4th industrial revolution requirements.

Furthermore, this research shows the correlation between the project management skills and the 4th industrial revolution, as well as a regression analysis to know the effect of independent variable on the dependent variable. Correlation and regression analysis have been proven using SPSS analysis that depends on the findings of the survey that has been conducted.

The results of the correlation analysis show that there is no significant relationship between (communication, critical thinking, decision making, quality management) and the 4th industrial revolution, however, it shows that there is a statistically significant relationship between (leadership) and the 4th industrial revolution. The results explain the importance of leadership in project management when implementing the requirements of the 4th industrial revolution, and how these two factors (leadership and industry 4.0) are connected to contribute to the project management prosperity. Whereas regression analysis proved that one of the independent variables which is (decision making) has a statistically significant effect on leadership.

This work aims to develop the project management field by paying attention to leadership while applying the 4th industrial revolution requirements.

Keywords: the 4th industrial revolution, project management, leadership, skills

نبذة مختصرة

يناقش هذا البحث التغيرات التي حدثت نتيجة الثورة الصناعية الرابعة وكيف أثرت على مهنة إدارة المشاريع ، مع تسليط الضوء على الدور القيادي في تنفيذ متطلبات الثورة الصناعية الرابعة. تقدم ورقة البحث هذه إطارًا يوضح العلاقة بين الثورة الصناعية الرابعة والمهارات القيادية التي يحتاج مدير المشروع إلى مراعاتها.

هذا البحث مهم لأنه يناقش عالم اليوم والتطورات التي نشهدها ، مع التركيز على مجال إدارة المشاريع. كما أنه يسلط الضوء على أحد أهم العوامل التي تساهم في هذا التطور وهي القيادة.

يحتوي هذا العمل على إطار عمل متكامل وتوصيات لتجنب الآثار السلبية للثورة الصناعية الرابعة في مجال إدارة المشاريع التي يمكن أن تتسبب في تقليل فرص العمل أوعدم قدرة الموظفين على مواكبة التغيرات التكنولوجية. حيث يحاول هذا البحث تحقيق أقصى استفادة من هذه التطورات من خلال إشراك القيادة لتقديم خدمة أفضل ليس فقط للأفراد وإنما لمجال إدارة المشاريع كافة مع مراعاة متطلبات الثورة الصناعية الرابعة.

علاوة على ذلك ، يوضح هذا البحث الارتباط بين مهارات إدارة المشاريع والثورة الصناعية الرابعة وتحليل الانحدار لمعرفة تأثير المتغير المستقل على المتغير التابع. تم إثبات الارتباط وتحليل الانحدار باستخدام تحليل SPSS الذي يعتمد على نتائج المسح الذي تم إجراؤه.

تظهر نتائج تحليل الارتباط عن عدم وجود علاقة ذات دلالة إحصائية بين (التواصل ، التفكير النقدي ، اتخاذ القرار ، إدارة الجودة) والثورة الصناعية الرابعة ، إلا أنها تظهر أن هناك علاقة ذات دلالة إحصائية بين (القيادة) و الثورة الصناعية الرابعة. توضح النتائج أهمية القيادة في إدارة المشاريع عند تنفيذ متطلبات الثورة الصناعية الرابعة ، وكيف يرتبط هذان العاملان (القيادة والصناعة 4.0) للمساهمة في ازدهار إدارة المشاريع. حيث أثبت تحليل الانحدار أن أحد المتغيرات المستقلة وهو (اتخاذ القرار) له تأثير ذو دلالة إحصائية على القيادة.

يهدف هذا العمل إلى تطوير مجال إدارة المشاريع من خلال الاهتمام بالقيادة مع تطبيق متطلبات الثورة الصناعية الرابعة.

الكلمات المفتاحية: الثورة الصناعية الرابعة ، إدارة المشاريع ، القيادة ، المهارات

ACKNOWLEDGMENT

The completion of this dissertation wouldn’t have been possible without the help of Dr. Maria Papadaki who never hesitated to assist me throughout the process, as well as all the people who took the time to be part of this research paper.

I am also very thankful to my family and friends for the support and encouragement they have been giving me to do my best.

Thank you!

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CHAPTER ONE: INTRODUCTORY

1.1. Introduction

Every research is done with a motive to prove a statement and establish a new, different, or even a complementary concept. This chapter is an introductory chapter that will involve research background, research problem, theoretical background, research aim, research objectives, research questions, hypothesis, and thesis structure.

1.2. Background of the Research

With the continuous rapid changes and the existence of new developments and systems that come along each era, a lot of project processes and methods have changed and still changing. Some organizations and individuals succeed in keeping up with these changes some of them fail to stay on track; therefore, they fall way behind and eventually vanish or become forgotten. The organizations and individuals who succeed are the ones who are balancing between soft skills, hard skills, and the changing environment; whereas the organizations and individuals who fail are the ones who lack soft skills, hard skills, and neglect the changing environment.

The fourth industrial revolution is the newest era that the world is witnessing today; this era involves the cloud computing systems and innovative systems such as; artificial intelligence (AI), virtual reality (VR), and internet of things (IoT) and much more. These systems enable project management professionals to ease their processes, increase productivity and effectiveness by deploying them in any stage of project management processes. However, they can have adverse negative impacts as well.

According to Klaus Schwab- Executive Chairman of the World Economic Forum (2016), the changes that the 4th industrial revolution has brought and still bringing are certain, and these changes cannot be considered as great opportunities only or potential threats only because they take place in both.

Even though the fourth industrial revolution is impacting today's project management in a significant way; it can't be denied that humans' skills are crucial in deciding the extent or the degree to which project management professionals can utilize these systems and benefit from them.

Project managers must acquire different leadership skills to positively influence their team members, and motivate them to move forward towards the future and think ahead; knowing

that project managers are capable of influencing their team members negatively. Therefore, the deployment of leadership skills is as important as implementing the 4th industrial revolution requirements because they interrelate with each other, and then produce outcomes based on how these two concepts have been utilized and deployed in the profession of project management.

1.3. Research Problem

There is a strong, interrelated, and responsive relationship between the 4th industrial revolution and leadership in the context of project management. When implementing the 4th industrial revolution requirements, it is important and necessary to take into account leadership skills to achieve effectiveness and efficiency in the project management profession.

However, some project managers or even organizations may focus on the new systems that facilitate project management processes and neglect the importance of human leadership skills in implementing these systems and make them human-friendly rather than human enemies. Where on the other hand, some organizations focus on human skills and neglect the new industrial revolutions which also results in unimproved work processes and outdated procedures. It is important to understand that focusing on one concept alone and ignoring the other will result in unpleasant consequences that will need to be treated and solve to survive.

This research is concerned with three main concepts which are; the 4th industrial revolution, project management, and leadership; as it will identify the importance of leadership and how leadership skills take place in project management when implementing the requirements of the 4th industrial revolution. As well as highlighting the opportunities and challenges of the 4th industrial revolution, identifying the most important leadership skills that are needed in this matter, and explaining how these two concepts can serve the project management profession more efficiently and effectively.

1.4. Theoretical Background

It is essential to highlight the importance of the study or topic that is being discussed, and the importance of this topic is to understand the relationship between leadership and the 4th industrial revolution in the context of project management, as well as recognizing the effectiveness of leadership in the project management field in the era of the 4th industrial revolution.

The known and existing theory is that the 4th industrial revolution takes place in different fields and one of them is project management, as it will have positive impacts on project management that will enhance the workflow.

However, there is a gap in the exiting theory mentioned above that this study will fill and investigate which is finding out and understanding the main driver and operator behind the positive impacts on project management in the era of the 4th industrial revolution. This paper will bring attention to the utilization of leadership in the 4th industrial revolution which will help in having positive outcomes such as time-saving, easier management, and increased productivity, knowing that leadership in this context is a moderator variable that controls and leads the outcomes. Furthermore, this research paper underlines the importance of leadership because leadership takes place in all other skills such as quality management and decision making; for instance, if there was no leadership there wouldn't be effective quality management and decision making.

1.5. Aim, Objectives, Research Questions and Hypothesis

1.5.1. Aim

This research aims to understand leadership skills that are taking place in the 4th industrial revolution era in the context of the project management profession. The result of this will be an integrated framework that enhances project management leadership skills to enable project management to cope with the requirements of the 4th industrial revolution.

1.5.2. Objectives

1- Review the current literature on project management and leadership.
2- Identify the different skills that are interrelated with project management leadership.
3- Explore the importance of the 4th industrial revolution in the context of project management.
4- Examine the opportunities and challenges of the 4th industrial revolution in the context of project management.
5- Propose an integrated framework that best captures the leadership skills to allow project management professionals to cope with the requirements of the 4th industrial revolution.

1.5.3. Research Questions

There are five questions that this research is attempting to answer, which are:

1- What is the relation between project management and leadership?
2- What are the skills that interrelate with project management leadership?
3- How does the 4th industrial revolution influence leadership skills?
4- What are the opportunities and challenges faced by senior project managers in implementing the 4th industrial revolution?
5- How do project management competencies have to change to enable project managers to cope with the requirements of the 4th industrial revolution?

1.5.4. Hypothesis

Achieving a balance between deploying leadership skills and implementing the 4th industrial revolution requirements will result in having a smooth workflow in project management processes that takes less time but achieves high productivity.

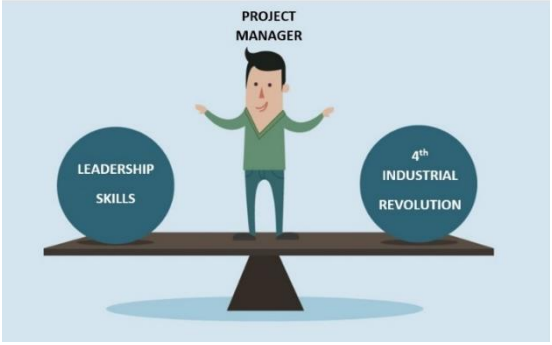


Figure 1 - Balancing Between Leadership Skills and the 4th Industrial Revolution in Project Management

1.6. Thesis Structure

Chapter1: is an introductory chapter that includes an introduction, a background of the research, research problem, research aim, research objectives, research questions, and hypothesis.

Chapter2: is the literature review that includes organization and project management, leadership and leadership skills, the 4th industrial revolution and its importance, opportunities and challenges on implementing the 4th industrial revolution, and a conceptual framework.

Chapter3: explains the research methodology through the strategy that has been used, the research design, and the sampling technique that has been implemented.

Chapter4: data analysis of the responses that have been collected through surveys to help the researcher and the readers to compare and contrast.

Chapter5: SPSS analysis of the main findings, as well as correlation and regression analysis between the variables.

Chapter6: discussion and interpretations of the findings from both primary and secondary research.

Chapter7: conclusion to summarize the research paper as well as proposed recommendations for further research.

CHAPTER TWO: LITERATURE REVIEW

2.1. Organization and Project Management

2.1.1. Organizations

An organization is a unit that consists of at least two people that communicate together by creating a network of authority, to work towards a common goal or set of goals; for example, achieving over 90% of customer satisfaction by the end of the year (Sims & Gabriel 1995). An organization can take many forms such as a government department (e.g, Ministry of Health) or a retail business (e.g. Amazon), Also, it could be large, small, domestic, or global. Within an organization, there are people, processes, and structures that define the aim of the organization, the tasks being done and assigned to members, and the authority levels from making decisions to execution and implementation (James L. Gibson, John M. Ivancevich, James H. Donnelly Jr. 2012).

People are considered to be the main asset, and their role within an organization is to interact with each other and achieve goals that they may not be able to achieve individually. As the number of people increases within an organization, the complexity increases. People in an organization have a huge impact on both organizational behavior and organizational culture (James L. Gibson, John M. Ivancevich, James H. Donnelly Jr. 2012).

Organizational behavior is the human behavior and norms in a work environment in terms of the performance of individuals that have an impact on other aspects such as job structure, communication, leadership, motivation, job satisfaction and more. Organizational behavior (OB) has different models which are autocratic, custodial, supportive, and collegial (Dailey 2016).

- **Autocratic:** where managers see that using their power and authority is the perfect way to get things done.
- **Custodial:** when economic security is being provided to employees through benefits.
- **Supportive:** where managers use leadership rather than the use of power or money.
- **Collegial:** where power is shared among all or some employees, and only a little direction from higher management is being provided.

	Autocratic	Custodial	Supportive	Collegial
Basis of Model	Power and authority	Economic Security (e.g. wages and benefits)	Leadership	Partnership and shared power
Managerial Orientation	Authority	Money	Support	Teamwork
Employee Orientation	Obedience	Security and benefits	Job performance	Responsible behavior

Figure 2 – Models of Organizational Behavior (Dailey 2016)

whereas organizational culture is the shared values, beliefs and assumptions among individuals within the organization, as it has a huge influence on the way that individuals act or perform their tasks. Organizational culture can be defined through four features which are (Morcos 2018):

1- **Unique:** there is no rigid rule when creating an organizational culture, it is meant to be unique.
2- **Identity:** an organizational culture contributes to developing an identity within the organization that is reflected externally.
3- **Adjustable:** organizational culture can be adjusted if the organization's mission has changed. This means that the organizational culture and the organization's mission must be aligned.
4- **Guideline:** organizational culture gives guidelines particularly when choosing employees, as the employers tend to choose candidates who would fit in the work environment and share the same culture.

In every organization, there is an organizational structure. A structure is a relationship between different components, whereas organizational structure is an arrangement of authority and tasks that people act upon to work towards organizational aims. This structure determines how the information flows among employees in terms of reporting, as well as defines the roles and responsibilities of each employee as placed in the structure.

Many factors contribute to the formation of organizational structures, and some of them are (Poli 2017):

- **Strategy:** a process that refers to the long-term or overall aim and objectives of the organization, as it includes the allocation of resources.
- **Size:** it is the size of the organization itself that is determined by its employees, its customers, financial resources, and materialistic resources.
- **Technology:** the kind of equipment and technological tools used.
- **Environment:** it includes the internal environment (e.g. workplace) and the external environment (e.g. competitors, economic aspect & suppliers)
- **Control power:** refers to the people with power and authority who have a huge impact on the organizational structure development.

2.1.2. Project Management

In order to define project management, it is crucial to understand the term project first. As defined in the PMBoK, a project is a temporary plan that has a beginning and an ending with specific goals, budget, scope, and resources, and it is undertaken to deliver certain products and/or services. The duration of projects differ from one to another, some projects might be within one week only, and others could take up to one year (Project Management Institute 2001). One of the projects' traits that is considered to be vital is progressive elaboration, this characteristic is combining the evolvement process and in-depth details of the project (Derbashi 2018). Some of projects examples are:

- Starting a campaign for environmental purposes.
- developing a new product or service.
- Building a new bridge.
- Introducing a film-making exhibition.

To accomplish a project, it is important to form a project team. A project team includes members that could be from different departments or even organizations, and they are put together based on their qualifications and skills needed to deliver the desired results and outcomes. Each member is given specific tasks and responsibilities to participate in the achievement of the project, and each task tends to have a time-duration to ensure that it is completed within the timeframe (Scott-young, Scott-young & Samson 2008).

Project management, on the other hand and as defined in the PMI, it is is the application of knowledge, skills, tools, and techniques that are essential to produce the required outcomes. Managing a project is about identifying the project's objectives, creating a project team, listing down the tasks and responsibility of each team member, transferring plans into actions, and measuring the progress of the project (Project Management Institute n.d.). There are many types of project management such as waterfall and agile project management methods.

Understanding the fundamentals of project management is important, therefore, defining traditional project management is essential to absorb the development of project management processes and methods. Project management is an action plan which falls into five steps or processes that affect each other in a significant way. These processes must take a specific sequential order to actively achieve the project's goals and objectives, and they are (Project Management Institute 1996):

- **Initiating:** it is the starting point and the first phase of any project lifecycle, and it usually includes a project charter that consists of the project's name, project manager, project team members, objectives, stakeholders, risks, and constraints. Also, it includes a feasibility study that decides the likelihood of completing the project successfully concerning many factors that could have an impact on the processes of the project such as economic, environmental, social, political and so on.
- **Planning:** once the previous phase gets confirmation, it means that there will be in-depth planning. The planning stage offers some kind of direction and guidance to the project team, and it determines the scope, objectives, deliverables, cost estimations, and tasks. As well as building up a work breakdown structure (WBS) that divides the work into smaller components to make it easier for the team to understand the requirements and have a clearer view on the overall project. Moreover, the work breakdown structure involves milestones and deadlines to catch up and be on time (Colenso, Principal & Systems 2000).
- **Executing:** this phase is heavily dependent on the planning phase because it is about turning plans into actions, allocating resources, and building deliverables. In this phase, each member is focused on the tasks assigned to them. Furthermore, this step requires a

lot of communication with team members, stakeholders, suppliers, and other parties who are involved in the project. Also, the project manager in this phase sets key performance indicators (KPI) to measure the performance level of each member.

- **Monitoring and Controlling:** this stage is associated with execution because it needs constant monitoring and controlling over the progress of the project and the variables that could happen that are out of the scope and are known as scope creeps. This phase is crucial because it assists the project manager and the project team to take instant actions as responses to the changes that could occur throughout the project lifecycle, and this will minimize potential problems and mistakes, and overcome the existing difficulties just in time. Moreover, monitoring and controlling help in tracking the performance and the quality of the work being delivered.
- **Closing:** it is the final step of the project management 5-step process. This step is the closure of the whole project when certain products and/or services have been delivered to the targeted group. What is important in this phase are the evaluations and analysis reports that are being done to use them as a future reference to compare projects and learn from the mistakes.

In every project, some areas need to be taken into consideration that affect the quality of the project. These areas are known as “The Triple Constraints of Project Management” or “The Project Management Triangle”. This triangle consists of scope, time and cost (Insight, Date & Projects 2008).

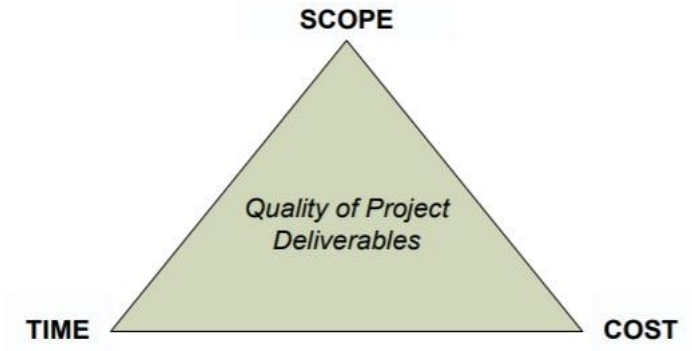


Figure 3 - The Triple Constraints of Project Management

- **Scope:** the goals and objectives of the project, including the tasks and deliverables.
- **Time:** the timeframe scheduled for the project completion.
- **Cost:** the budget of the project and its value.

These three constraints could affect the project's progress in a major way. for instance, if there were unexpected variables in the project left unsolved, the tasks are completed behind schedule, and the financial costs are over the budget, it means that the project is going out of scope, the project would not be completed on time as scheduled, and the project is costing more than the planned budget to complete the project. Therefore, these constraints need to be observed to treat any undesired changes that occur, stay on track with the project timeframe, and lower the costs and reallocate resources if needed.

It is crucial to define project managers. A project manager is the one with full control over the project that has been assigned to him/her, usually, a project manager gets to choose the project team members that will be working on the completion of the project as well. Project managers tend to have a clear extensive vision, and a set of skills that allow them to earn the role of being project managers and to have the most authority over the planning, implementation, and the monitoring of projects (Crawford et al. 2008). However, it is critical to train, mentor and evaluate project managers before assigning projects and responsibilities to them to prepare them for the project environment as well as widen their knowledge. Some of the qualities that a project manager must have are (Riaz & Comsats 2015):

- Leadership
- Decision making
- Tolerance
- Critical thinking
- Team builder
- People-oriented
- Target-oriented

A project manager is the fundamental cause of either the project's success or failure because the project manager's practices of the mentioned qualities above influence the outcomes in a significant way. for that reason, project managers must be chosen wisely.

Every project manager must be aware of Project Management Knowledge Areas. Project Management Knowledge Areas consist of 10 areas that are considered to be the fundamental skills and are necessary for effective management of projects. Furthermore, a project manager needs to practice and take into account these different areas in every single project that is being handled. And these areas are (KNOWLEDGE CENTER INC. 2016):

Figure 4 - Project Management Knowledge Areas - (KNOWLEDGE CENTER INC. 2016)

1. **Project Communication Management:** communication is one of the core skills that ensures that every party included in the project is updated with what is being worked on at the moment, and what has been achieved so far. Communication, in this case, is both internally and externally, with all participants that include the project manager, the project team, stakeholders, sponsors, suppliers, potential customers, and so on. The benefit of communication is to keep on track and stay updated along the project lifecycle.
2. **Project Cost Management:** this area requires a cost plan that will assist in managing the expenditures. When planning a project, it is necessary to set a budget that will cover the costs of the project requirements (e.g. labor, food, materials, equipment, advertising). The costs of the project's requirement could either go below the budget, which is good, or exceed the project's budget which might cause some kind of problems, and in this case, the use of Project Cost Management Plan could be helpful to know and control the spending.
3. **Project Human Resources Management:** this area is basically about improving the manpower and workforce. Human Resources Management involves improvement programs to ensure the development of the project team and to improve their soft

skills (e.g. communication) and their hard skills (e.g. technical skills) and ensure that these skills are being used to their full potential. Also, this area includes assigning roles to the project members based on each member's capabilities and qualifications.

4. **Project Integration Management:** this area is about identifying and defining the project, which is building a project charter that takes place in the first phase of PMI processes which is "initiation". Moreover, integration is taking place in constructing the project as it deals with the possible changes that happen along the project's lifespan. Also, it is about the relationship between the stakeholders and sponsors to get approvals on the changes that have been taken. Not to mention that integration management is also part of the closure phase of PMI processes.
5. **Project Procurement Management:** this area is about anything that requires purchasing (e.g. materials & equipment). This area is very essential because it affects the costs of the project as well as the schedule in terms of receiving the supplies on time or not, knowing that these two factors are two of the significant constraints. Furthermore, team members tend to compare the quotations and prices that are given by different suppliers and sellers.
6. **Project Quality Management:** quality in this area is being determined by the deliverables (products and/or services). Quality assurance is very essential, and for that reason, it is important to set standards for the project team to follow and to achieve high-quality performance. In this area, the quality is being observed and fixed. knowing that quality is one of project management constraints and every other constraint is affecting the quality.
7. **Project Risk Management:** every project encounters risks and for that reason, it is essential to have Project Risk Management. this area is all about identifying the potential risks, conducting risk assessment templates, putting solutions for these potential risks that have been identified. However, these risks could be "risk threats" which is negative, or "risk opportunities" which is positive. Furthermore, as a response to this area, project managers prepare something called "Risk Register" which identifies all the potential risks, their probability of happening, their effects, and solutions to minimize or eliminate the risks.
8. **Project Scope Management:** this area is about preparing a scope statement, this statement lists the project's objectives, requirements, work breakdown structure, and deliverables. This area mostly takes place in the "controlling and monitoring" phase of the PMI processes, because it is about maintaining the scope and preventing scope

creeps from happening. This area will help the project manager and its team to work within the scope limits and boundaries and eliminate the unwanted changes that could occur. Moreover, the project manager is capable of making any changes to the scope statement if needed.

9. **Project Stakeholder Management:** stakeholders are also the owners of the project, as they significantly impact the project and are impacted by the project too. Therefore, it is important to know the stakeholders' needs and work accordingly, as well as pursue their approvals in case if any changes are intended in the project.
10. **Project Time Management:** in this area, project managers tend to prepare a template that is similar to the work breakdown structure, except that this template involves the duration of each task that has been assigned to each member. Also, "Gantt Chart" is used in this area, as it shows the tasks as bars clarifying the beginning and the ending of each task to ensure the completion of the task on time. This area contributes to eliminating delays and staying on track.

2.1.3. Traditional Project Management

Traditional Project Management is a method that is highly dependent on documentation and analysis. It is the use of tools and templates such as Work Breakdown Structure and Gantt Chart.

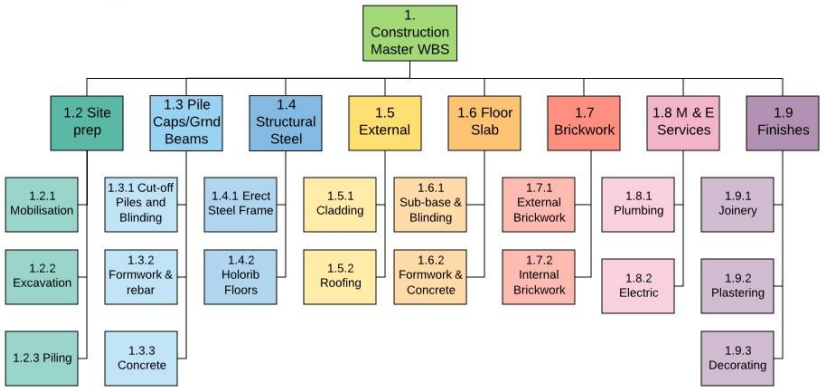


Figure 5 - Work Breakdown Structure

The figure above represents a Work Breakdown Structure template. It is a deliverable-based structure and this template aims to divide the work into smaller components that will make them more manageable and organized. This structure is commonly used at the beginning of the project to define the scope of the project, and it stays throughout the project lifecycle (Carpentier n.d.).

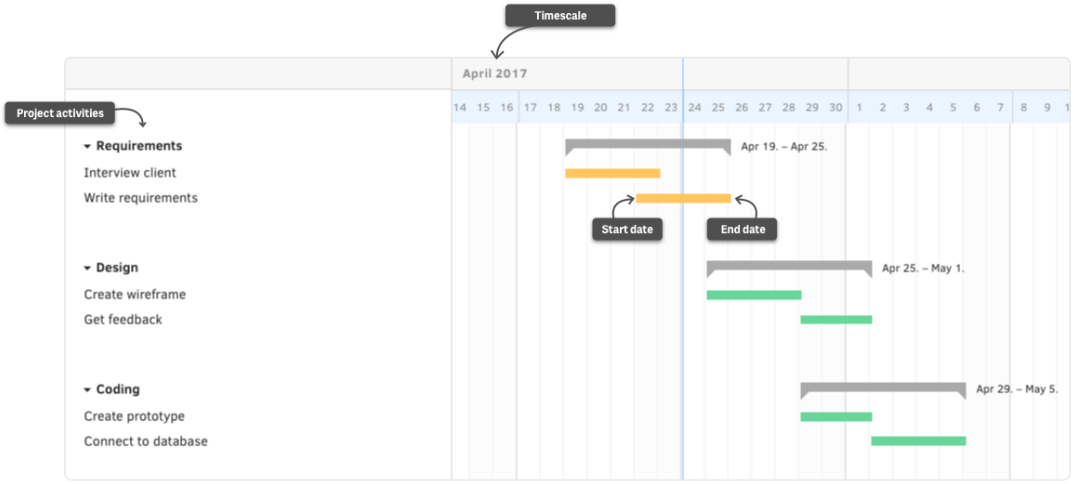


Figure 6 - Gantt Chart

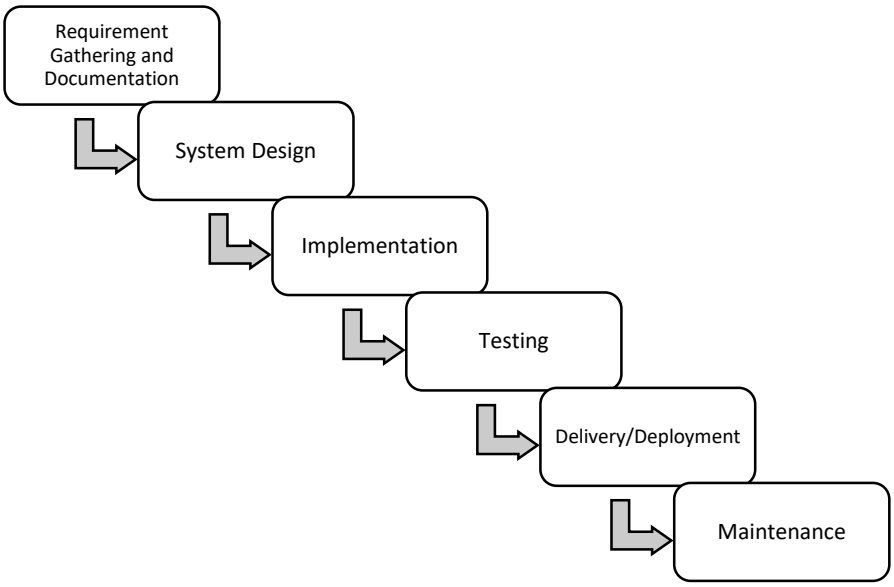
Whereas the figure above is a representation of a Gantt Chart, and it is mainly used to show the tasks in the shape of bars. Not to mention that is shows not only the number of tasks, but also the member responsible for this task, the duration of each task, the beginning of each task, the ending of each task, and the overlaps between these tasks (Durfee n.d.).

Traditional PM is usually used when the plan is well defined and the deliverables are clear. Furthermore, traditional PM strictly follows the "triple constraints" process where the project must be within the limits of the scope, must follow the schedule, and must be either on or below the budget; these three constraints are controlled to achieve the best quality. Generally, traditional PM is used on projects that follow sequential order (e.g. waterfall approach), as it includes five stages which are initiating, planning, executing, monitoring and controlling, and finally closing (Spalek 2017).

2.1.4. Hybrid Project Management

Hybrid Project Management is a combination of a plan-driven method (e.g. waterfall model) which is considered to be a traditional project management method, and agile project management which is considered to be a developed project management method.

The waterfall approach is a sequential development method, where it breaks down the tasks and each task is dependent on the previous deliverables and then completes the next phase or task accordingly. This approach consists of six stages which are (AMNA ZULQADAR 2019):

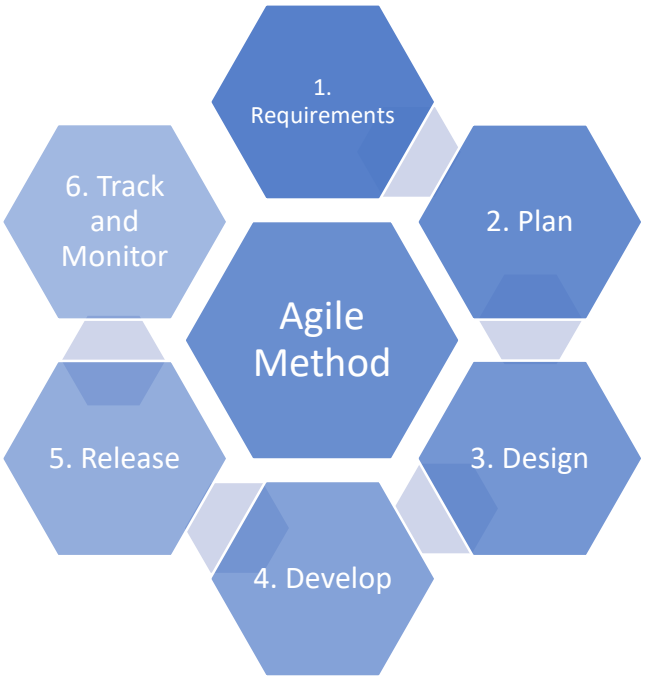


1- **Requirement Gathering and Documentation:** in this stage, all project's requirements are being identified, analyzed, and documented. Also, a feasibility study is being conducted to figure out if the requirements were valid. Moreover, the limitations and constraints (e.g. scope, budged & time) are acknowledged as well.
2- **System Design:** it is the specification of the systems, programming, networking, and other data layering. This phase is dependent on the requirements that have been stated earlier.
3- **Implementation:** after system design comes the actual implementation and creation of systems and the building of software. This stage is about turning the system design specifications into a physical design or product.
4- **Testing:** it is about putting the system or software under the test to detect any errors, bugs, or defects that need to be fixed.
5- **Delivery/Deployment:** it is the stage where the final product is ready to be served for end-users (e.g. customers).
6- **Maintenance:** after the final product has been provided for the end-users, continuous maintenance is involved to ensure that the product (e.g. software) is working smoothly and to make it error-free.

The advantages and disadvantages of the waterfall approach are as shown in the table below (Aiden Gallagher, Jack Dunleavy 2019):

Advantages	Disadvantages
Each phase has a specific timeframe to be completed before moving to the next phase	Problems might arise in one phase after it has been completed, which is quite difficult to be treated or fixed
Minimal resources needed in this model	Changes don't often happen even if it was based on customers (end-users) requirements
Easy to implement	

Whereas agile project management is adaptive, quickly moving, and constantly changing model that is best described as a flexible model. Here's an illustration of the agile model. It is fair to say that agile model has almost the same stages or phases as the waterfall model, which are (The Practical Adoption of Agile Methodologies 2015):



1- **Requirements:** understand business requirements in detail.
2- **Plan:** once the requirements are proved to be feasible and viable, the identifications of features come after.
3- **Design:** the design of the product and how it will look like happens in this stage.

4- **Develop:** this phase includes the actual building of the product as it involves coding and other programming developments.
5- **Release:** the publication of the product to its end-users.
6- **Track and Monitor:** continuous support provided to track and monitor the product and the way it functions.

The advantages and disadvantages of the agile method are (Shankarmani 2012):

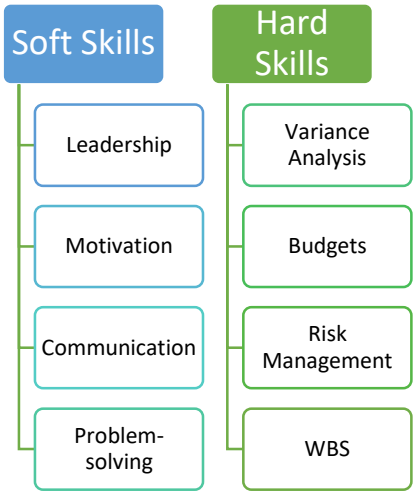
Advantages	Disadvantages
High ability to quickly respond to changes	The plans are less rigid due to the reprioritization of tasks
Encourages face-to-face communication	The deliverable can be significantly different from what was initially planned
Customers opinions are taken into consideration	

However, hybrid project management combines the thoroughness of work breakdown structure and waterfall model, and the elasticity of agile project management method; as it blends between the manual work and the automation work. Hybrid PM helps project managers and the project team to plan before starting to work on the project, as well as allowing them to handle changes that occur throughout the project's life; unlike traditional project management alone (Hillaire 2018).

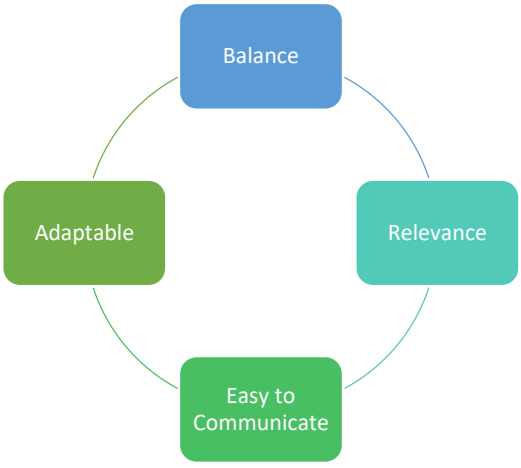
2.2. Leadership and Leadership skills

2.2.1. Soft and Hard skills Required in Project Management

Project management is a dynamic process that requires skills and traits to have control over the changes that arise in projects. Skills are divided into two groups; there are soft skills and hard skills. The soft skills are interpersonal, they are the intangible ones, don't require the usage of tools, and are not directly affecting the deliverables and the outcomes; and some of them are communication, leadership, decision making, negotiation, and so on. Whereas hard skills are the ones that are associated with technical skills, they are tangible, require the practice of tools and templates, and directly affecting the deliverables, some of them are engineering, programming, banking, accounting. Knowing that building a critical path diagram or a breakdown structure (WBS) goes under the hard skills category.



It is important to understand the difference between skills and competencies. A skill is an ability that could be learned to accomplish certain tasks, whereas competencies is a broad concept that includes ability, knowledge, and behavior combined together (Talent Align 2012). There are other competencies that are crucial in project management, and must be carried by project managers and the project team as well in order to prevent and minimize the chances of project failure; some of these competencies are balance, relevance, easy to communicate, and adaptable (Of, In & Projects 2012).



- **Balance:** the balance between the use of soft skills and hard skills.
- **Relevance:** the project's deliverables must be relevant to the project's goals and objectives that have been set at the beginning of the project.
- **Easy to communicate:** information, knowledge, and data must be easily communicated whether it was to the project team members, sponsors, or potential consumers.

- **Adaptable:** the project manager and the team should be adaptable to changes that could occur as a result of stakeholders' requests.

Commonly, projects fail because they might go over the planned budget, not following the timeframe that is scheduled to finish the tasks, and sometimes not delivering the product or service that is meant to be produced and delivered. The reasons behind the failure of projects are often associated with the deployment of soft and hard skills; some of these reasons are (Adams 2016):

1- Poor communication with the project team members.
2- Poor leadership to lead the project's direction.
3- Inability to solve problems and deal with the scope creeps.
4- Ineffective estimation plans that end up having different results.
5- Inadequate training is given to the project manager.
6- Misusing methods and structures.

For these reasons, the deployment of both soft and hard skills is important, and balancing between them is the key to the successful management of projects and achieving the desired deliverables. Knowing that some project managers could have excellent soft interpersonal skills but lack the hard-technical skills aspect, and vice versa. Therefore, training and programs are being arranged for project managers to acquire the needed skills and knowledge to lead projects to success. For instance, if a project manager has excellent technical skills but ineffective soft skills; it will lead to:

1- A slow progression of the project.
2- Ineffective communication of information.
3- Exceeding the budget.
4- Unproductive allocation of resources.
5- Ineffective risk management plan.
6- Lack of flexibility.

2.2.2. Leadership

Leadership is one of the most vital soft skills that an individual could acquire or practice. Leadership is the ability to lead, influence, and inspire individuals or a group of people to achieve a common goal. Furthermore, leaders tend to impact the way that people perceive things, think, act, and behave. Some people might confuse the two concepts of management

and leadership. Management and leadership are two separate and different concepts, however, the only thing that is in common is getting the work done. Management is primarily the process of controlling things and people to achieve certain aims and objectives. The table below shows the main differences between leaders and managers (Klingborg & Moore 2014):

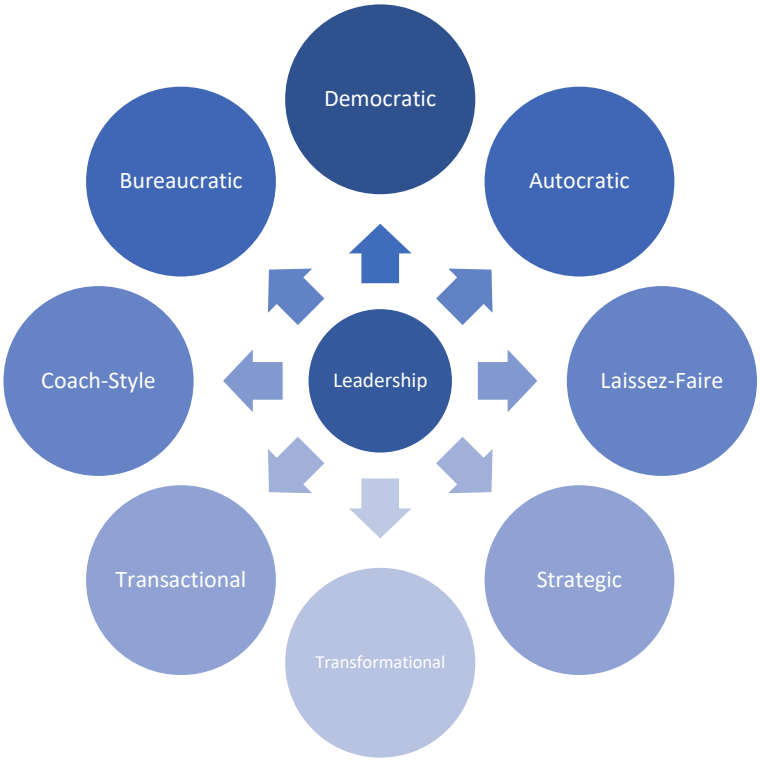
Leaders	Managers
Influence and encourage people	Instruct people and tell them what to do
Maintain motivation	Maintains the flow of work
Focus on people	Focus on tasks
Risk takers	Minimize risks
Coach people	Direct people

According to Surji (2015), leadership characteristics are in fact within the word itself, and it is best defined as follows:

"LEADERSHIP"

- **Listen:** being a good listener and communicate with people effectively.
- **Enthusiasm:** show excitement and interest over achievements.
- **Aspiring:** having high hopes and ambitions to thrive.
- **Decisive:** critical thinker and good at making decisions.
- **Empower and Encourage:** provide support to people.
- **Responsible:** being accountable and responsible for actions that have been taken.
- **Supportive:** show care, empathy, and attention to people which creates a friendly environment.
- **Humble:** make people feel important and help them to recognize their value.
- Inspire and Integrity:
- **Plan**: being good at strategic planning; always planning and having a backup plan.

Leadership can take different styles and types, and the most commonly used styles are democratic, autocratic, laissez-faire, strategic, transformational, transactional, coach-style, and bureaucratic.



1- **Democratic Leadership:** this leadership style tends to be the most effective because lower-level employees are given equal opportunity to contribute to making decisions that give them a sense of authority over made decisions. In this style, the leader listens to all employees' feedback and ideas to choose the most appropriate one that is sometimes done by voting (Kumar & Keshorjit 2013).
2- **Autocratic Leadership:** it is the opposite of democratic leadership, and it is considered to be rarely effective. Employees' are not being considered or even consulted when it comes to making final decisions or new plans, however, they should follow the decisions that are made by the leader. For example, the manager, in this case, can change the tasks that have been given previously to the employees and expect them to perform the new tasks without negotiation. This leadership style lacks employee empowerment (Kaleem 2018).
3- **Laissez-Faire Leadership:** laissez-faire is a French term that means letting things take their course without interfering or getting involved. The leader, in this case, gives almost all authority to the employees which allow them to make decisions without being influenced by the leader. This leadership style is all about giving employees full trust and empower them to make decisions (Juan, Al-malki & Juan 2018). However, this kind of leadership needs to be kept in check to ensure that the organization's goals are being

achieved. Also, some drawbacks could be limiting employees' development and missing important opportunities that impact the organization's growth (Ekmekci & Tosunoglu 2016).

4- **Strategic Leadership:** it is about taking into account both the organization's operations and the possible advantages and opportunities. Leaders who follow this style have a strategic vision and influence other employees to pursue that vision and work upon it. Furthermore, strategic leaders can be determined and flexible at the same time; they listen to their employees' feedback and thoughts and also keep up with the working-environment changes that would affect the organization (Davies & Davies 2014).
5- **Transformational Leadership:** it is about motivating and supporting employees to work towards a common goal. This leadership style is mainly concerned with organizational growth which may result in pushing employees beyond the limits of their comfort zone to achieve the fullest of their potential. Also, it takes into account the idea of transforming employees into future leaders by understanding their strengths to reinforce them and recognizing their weaknesses to eliminate them (Burns, Bass & Handbook 2008).
6- **Transactional Leadership:** this leadership style adopts the policy of giving something in return for following or achieving certain goals, and it is either by rewarding or punishing employees to keep them motivated. This style leans more towards a managerial leadership style because it focuses on the role of direction, administration, and supervision (Kabeyi 2018).
7- **Coach-Style Leadership:** it is about focusing on employees' strengths, growth, and success. Also, it is about coaching employees, giving them full support, and providing them with constructive feedback about their performance in order to improve. Essentially, this leadership style is about instructing and training employees to acquire the needed knowledge and skills (Karlsen 2017).
8- **Bureaucratic Leadership:** this leadership style follows guidelines and rules thoroughly; it considers employees' feedback and comments as long as they are following the organization's policies. This style is commonly used in organizations where threats are genuine and out there (Kaleem 2018).

All leadership styles that have been mentioned have advantages and disadvantages, however, some may have more advantages compared to the rest of the leadership styles and vice versa. The table below shows the level of effectiveness of each leadership style that has been

discussed above in terms of motivating and developing employees and achieving the organization's goals and objectives.

Commonly Effective	Sometimes Effective	Rarely Effective
Democratic Leadership	Laissez-Faire Leadership	Autocratic Leadership
Strategic Leadership	Transformational Leadership	Bureaucratic Leadership
Coach-Style Leadership	Transactional Leadership	

2.2.3. Leadership Skills

In order to achieve organizational goals and objectives, project managers must practice some of the essential leadership competencies and skills. Leadership skills help maximize effectiveness to accomplish aims and objectives when they are being used at the right time. These leadership competencies are but not limited to (Doyle 2019):

1- **Communication:** this skill requires one-to-one communication, full-staff communication, face-to-face communication, and remote communications (e.g. emails & cellphone). Also, this skill involves another skill which is listening, being a good listener creates a great communicator. Great communication keeps employees and project managers up-to-date which will result in immediate actions and responses.

2- **Motivation:** motivating employees is one of the most important leadership skills because it is the factor that keeps employees performing at high levels and getting the work done. Project managers who lack this skill might suffer from the effectiveness and productivity of their employees because employees, in this case, are not motivated to work to their full potential or meeting the tasks' deadlines. Therefore, project managers must constantly keep their employees motivated by monetary or non-monetary rewards.

Monetary	Non-monetary
Salary	Recognition
Bonuses	Training programs
Promotions	Job security

3- **Empowerment:** empowering employees by giving them opportunities to contribute to making decisions. This skill gives employees who are being empowered the sense of confidence which will maximize their productivity in the organization.

4- **Constructive feedback:** to learn for the mistakes and perform better it is crucial to give constructive feedback to employees. It is stated in this skill as constructive because it builds up employees' skills and knowledge, unlike destructive feedback which destroys employees eager and enthusiasm to do better.
5- **Responsibility:** it is about achieving the desired deliverables, and willing to take the blame for mistakes that are being done and try to solve them. Engaging with stakeholders, communicating with employees, and achieving the project's aims are some of the project manager's responsibilities. Even more, responsibility can be delegated.
6- **Accountability:** it could be similar to responsibility; however, responsibility can be shared whereas accountability cannot be shared. Furthermore, accountability is taking the ultimate responsibility for something and being able to answer the higher authority for the work that has been performed. Also, accountability can't be delegated.
7- **Delegation:** it is when project managers delegate tasks to employees by assigning roles and duties based on their capabilities and set of skills rather than doing the whole tasks by themselves. Delegation assists project managers to get as much work done as possible which minimizes delays.
8- **Positivity:** it is about creating a positive work atmosphere by having a positive attitude, constructive feedback, and caring about employees' wellness. This positive environment will result in higher productivity and a friendly, stress-free atmosphere.
9- **Commitment:** being committed to aims and objectives that have been decided earlier is important to accomplish a successful project. Therefore, project managers should not hesitate to spend more hours working on projects because it will influence their employees positively and make them willing to work even more.
10- **Flexibility:** project managers must be flexible and adaptable to the changes that occur. For those specific reasons project managers must have back-plans to be implemented if unexpected changes occurred.

2.2.4. Leadership 4.0

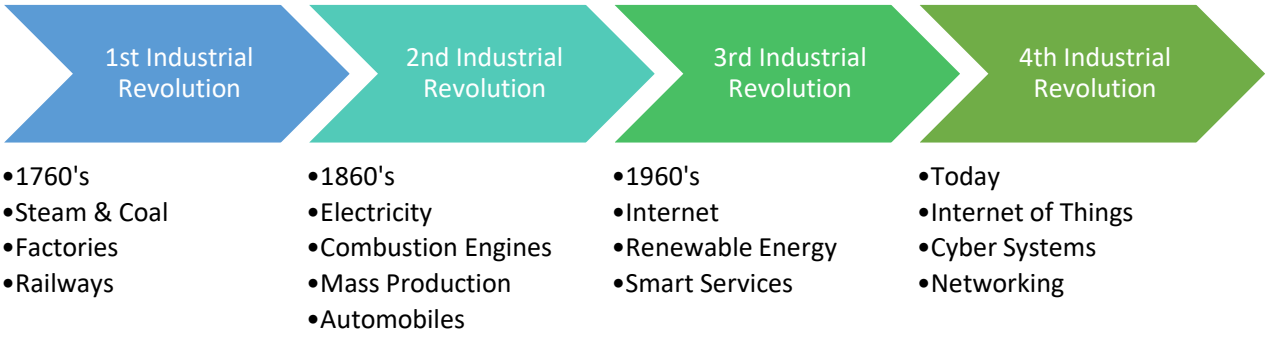
Leadership 4.0 is referred to the leadership in the fourth industrial revolution, as it is considered to be a leadership style that is fast, cooperative, innovative, and advanced (Oberer & Erkollar 2018). According to the World Economic Forum, there are 4 types of leaders that could be following and adopting leadership 4.0 which are (Renjen 2019):

1- **Social Supers:** they are the ones that concentrate on social initiatives, and are balancing between offering things for the society and making profit.
2- **Data-Driven Decisive:** they are the ones that analyze data and make decisions based on what has been analyzed. This type of leaders has the ability to succeed in the fourth industrial revolution because they have the capability of capturing opportunities that come along industry 4.0.
3- **Disruption Drivers:** they are the ones that focus on the disruptive innovations and developments which is what the fourth industrial revolution is all about. This focus gives the leader the advantage to adapt to the industry 4.0 changes and emerging technologies.
4- **Talent Champions:** they are the ones that focus on the talents of their employees, so it is more like investing in the employees to achieve the requirements of this changing environment.

2.3. The Fourth Industrial Revolution and its Importance

2.3.1. The Fourth Industrial Revolution

Before discussing the 4th industrial revolution, it is crucial to mention all the 3 revolutions that the world has been through. All these four stages of industrial revolutions have affected the world significantly, impacting not only the world's economy but also people's lifestyles. In the 1st industrial revolution, steam and coal were discovered, railways were built, as well as the building of different types of factories. In the 2nd industrial revolution, combustion engines were developed, the building of roads, the discovery of electricity, the invention of automobiles, and the expansion of mass production activities which is the production of certain products in large quantities with the help of mechanical processes. The 3rd industrial revolution involved the invention of the World Wide Web (WWW) which is the internet, renewable energy was discovered, and smart services like booking a flight through the internet (Cyber Security Intelligence 2015).

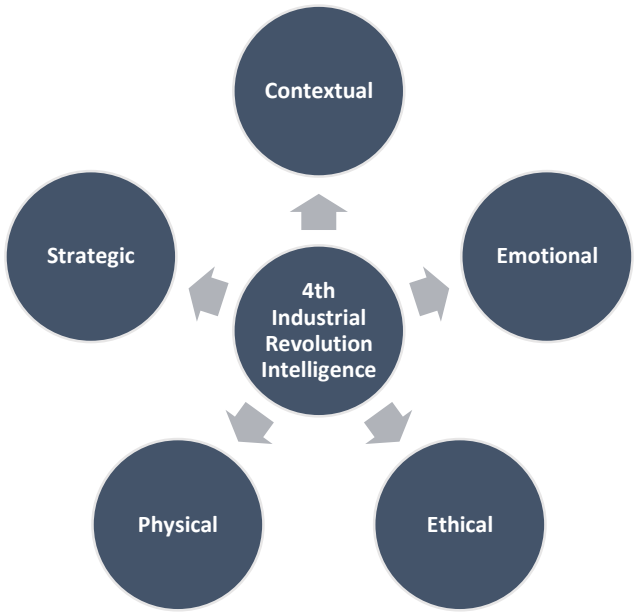


The fourth industrial revolution is a term that is created by the founder and executive chairman of the World Economic Forum, Klaus Schwab. This term or phrase is used to describe the environment nowadays that has shifted heavily to the digital world. Furthermore, it is the development of technologies that are significantly affecting the way that people live and work, as well as encouraging innovation, modernization, and the creation of new markets. These disruptive technologies take the forms of (but not limited to):

- **Internet of Things (IoT):** it is the connections and networks of programmed and computed devices that happen through the internet, which allow these devices to send and receive data without human intervention. These devices could be computers, cellphones, toys, airplanes, vehicles, business systems and so on (Salazar 2019).
- **Robots:** machines and automation technologies that have been programmed by computers which make them capable of handling a complex series of data and actions. Robotics takes place in many industries such as healthcare, manufacturing, logistics and more. A few examples of this technology are (International Federation of Robotics Frankfurt 2018):
    - The machines that are programmed to manufacture and assemble car parts.
    - The Magnetic Resonance Imaging scans (MRI) that are used to scan the insides of a human body and take detailed images.
- **Virtual Reality (VR):** it is a simulation of the real-world environment and it is generated by computers. This kind of technology creates a three- or four-dimensional image or environment that makes it appear real with the help of special equipment such as helmets, eyeglasses, or even hand gloves to transform the virtual visualization and sensation into reality. In other words, it is a technology that makes the user participates in the virtual world. Virtual Reality is a concept that was known by many other names such as synthetic reality and artificial reality (Onyesolu 2015).

- **Artificial Intelligence (AI):** it is a computer-developed system that is capable of performing tasks that need the involvement of human intelligence. This system takes many forms such as translating languages, problem-solving, navigations, self-driving cars and so much more (Intelligence et al. 2015).

The framework below is a representation of the 4th industrial revolution intelligence, identifying and explaining intelligence types that take part in the 4th industrial revolution and the continuously developing environment (Oosthuizen 2017).



- **Contextual Intelligence:** represents the mind, and it is the understanding of situations, analysis of circumstances, and application of knowledge.
- **Emotional Intelligence:** represents the heart, and it is the relation between thoughts and feelings in terms of processing and integration.
- **Ethical Intelligence:** represents the morals, and it is about knowing what is right and what is wrong.
- **Physical Intelligence:** represents the body, and it is about maintaining personal health and individuals' wellbeing.
- **Strategic Intelligence:** represents the orientation, and it is about the capability to adapt to the changes that arise in the environment by gathering and examining these changes.

2.3.2. The Four Industrial Revolutions in Relation to Alderfer's ERG Theory

To understand the differences even more, this research paper will compare the four revolutions to Alderfer's ERG Theory. Alderfer's ERG Theory is a theory of motivation and an extension of Maslow's Hierarchy of Needs Theory. Maslow's theory discussed the five

main levels of human needs which are; psychological needs, safety and security needs, love and belonging needs, esteem needs, and self-actualization needs. In 1969, Clayton Alderfer refined these needs into three categories of needs which are existence needs (E), relatedness needs (R), and growth needs (G). The main reason behind Alderfer's ERG Theory is to show the relationship between humans' satisfactory needs and desires (Elvira & Castellanos 2014).

However, it has been added to ERG Theory the four industrial revolutions to fit each level of needs. As shown in the diagram below, existence needs represent the 1st industrial revolution, relatedness needs represent the 2nd and 3rd industrial revolution, and growth needs represent the 4th industrial revolution.

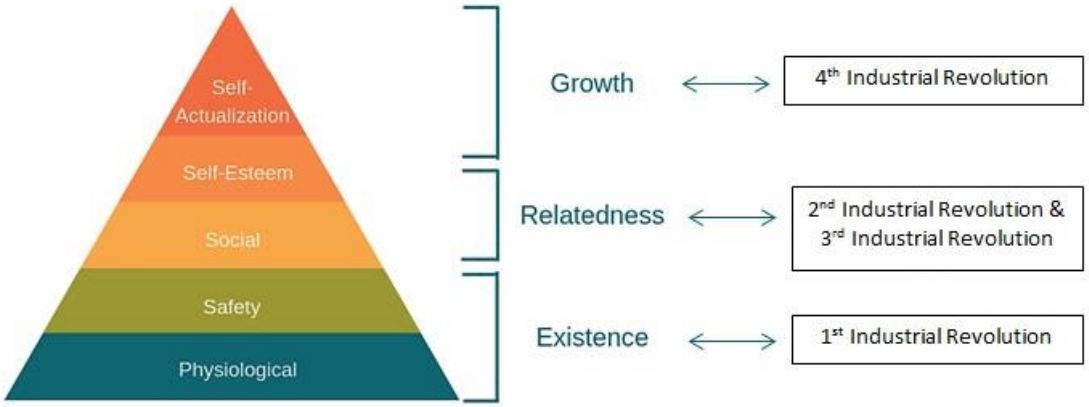


Figure 7 - Alderfer's ERG Theory in Relation to the Industrial Revolution Eras

Starting from the bottom of the hierarchy; physiological needs are the basic needs of human beings such as food, water, warmth and shelter, safety needs are the needs of feeling safe and secured, social needs are about the feeling of belonging and the relationships between individuals, self-esteem needs are the ones related to the feeling of accomplishments and need of recognition, and finally, self-actualization needs are the highest levels of reaching one's full potential and creativity (H. Tezcan UYSAL, Sibel AYDEMIR 2018).

The ERG levels (Existence, Relatedness, and Growth) are recognized in those needs as explained below:

- **Existence level:** takes place in the physiological and safety needs
- **Relatedness level:** takes place in the social and self-esteem needs
- **Growth level:** takes place in the self-esteem and self-actualizing needs

If we relate those 3 levels to the four industrial revolutions it will be like the following:

- **The 4th industrial revolution** is seen in the "growth level" because it reflects the needs of creativity and development.
- **The 2nd and 3rd industrial revolutions** are seen in the "relatedness level" because it is about building power and recognition.
- **The 1st industrial revolution** is seen in the "existence level" because it reflects the basic needs of individuals in order to survive.

2.3.3. The Fourth Industrial Revolution's Importance

The fourth industrial revolution is more than just technological advancements and developments; however, it is about the merging of multiple aspects such as biological, digital, and physical innovations. This era is important for projects, economy, and the people as well (Nagy, Ol & Erdei 2018).

- **Projects:** projects will be affected by the leading technologies that ease the processes by connecting systems together through cloud computing to govern, track, and take instant actions remotely. The fourth industrial revolution will enable effectiveness and efficiency when it comes to communication, administration, and keeping on track.
- **Economy:** by the disruptive developments of systems such as artificial intelligence, the internet of things, and virtual reality; the fourth industrial revolution will create new markets. Having access to new products and services will impact the economy positively. This will result in a sustainable economy.
- **People:** as mentioned above, new markets will emerge as a result of the 4th industrial revolution era; therefore, new job opportunities will come along with these new markets and industries. Also, this era will build a workforce that is ready for new changes and advancements.
- **Other industries:** the fourth industrial revolution will have a huge and positive impact on other industries as well; such as education and healthcare. Education will be impacted in a way that will have more advanced technologies that will build a skilled generation. Whereas the healthcare industry will be having advanced testing systems; for example, virtual reality will be implemented to build a simulation of a case that is existed which will allow candidate surgeons to operate and practice on the simulation that is provided.

And as quoted by Klaus Schwab- Executive Chairman of the World Economic Forum on the 4th industrial revolution (2016) "*Let us together shape a future that works for all by putting people first, empowering them and constantly reminding ourselves that all of these new technologies are first and foremost tools made by people for people"*. This quote shows that humans will always be the most important and vital element even in the midst of the greatest technological developments.

2.3.4. Project Management Before the 4th Industrial Revolution

Project management before the 4th industrial revolution was highly dependent on information technology and automation at some levels. However, it is leaning more towards the traditional project management that is seen as solid and kind of unchangeable in terms of scope, which makes it inflexible and the tendency towards project failure is higher if the planning and the identification of scope and objectives were not clear (Otero-mateo & Pastor 2017). Furthermore, in the 1970's which was during the third industrial revolution, businesses and organizations were just starting to realize the importance of integrating work from all departments and organizing work to accomplish a certain project (Watt 2014).

2.3.5. Project Management After the 4th Industrial Revolution

Almost all industries and professions are affected by the developments and the advances that came along with the 4th industrial revolution era, as well as project management. As mentioned above, the 4th industrial revolution is mainly about digital transformation, this transformation is taking place in strategy development, execution, and delivery. Furthermore, project managers will be able to view the project model, framework, and its operational processes in a more progressive and innovative way. This era is allowing project managers to integrate digital developments and data to implement advanced strategic and tactical methods, embracing agility, and maximizing value delivery through the products and services provided. However, the main asset in all organizations will always be the people; no matter how far the developments have gone with the 4th industrial revolution.

In order to keep up with the 4th industrial revolution as a project manager, it is required to take into account the following skills and competencies (Bolick 2019):

1- **Promote agility and flexibility:** this is not about the usage of computers only; it is about using technological capabilities to its full potential. Project managers must be

adaptive to changes that usually occur in any project which will result in identifying value, having more flexibility, and utilize creativity.

2- **Develop intellectual capacity:** it is the ability to think, analyze, and understand information, and apply knowledge to solve complex situations. Intellectual capacity reflects the concepts of leadership, critical thinking, and cultural awareness.
3- **Embrace resource dynamics:** it is about combining native knowledge and new resources that could be robotics or artificial intelligence to promote the efficient deployment of digital transformation.
4- **Emphasize emotional intelligence:** with disruptive technologies and developments; it is crucial to consider emotional intelligence which is the ability to handle interpersonal relationships by applying 5 important elements which are self-awareness, empathy, self-regulation, motivation, and social skills. Emotional intelligence must be acquired by all individuals and most importantly by leaders to achieve personal and professional success.

Furthermore, with the 4th industrial revolution era, there will be further elements in project management that need to be wisely measured and controlled, as these elements will be contributed to project management significantly. Some of these elements are (Zin, Nang & Moon 2018):

1- **Big Data:** with the drastic technological advances that are resulted from the 4th industrial revolution there will come big data along with these developments. This data is large in volume, complex, and can take different formats. Even though there will be a variety of tools to process big data; individuals who have the knowledge and expertise to do this job may not be capable of using these new tools.
2- **Autonomous System:** it is a developed system that is computer-driven which enables the device that has this kind of system to operate autonomously and do the work alone without human interventions. Moreover, these devices will be able to take actions on their own, deal with complex situations, and adapt to changes when occur. Therefore, 4th industrial revolution project managers must ensure the smooth flow of the work that is being operated by the autonomous systems.
3- **Systems Integration:** as mentioned above, these various systems and devices will be integrated and connected, for that reason, the project manager should ensure that hardware and software used are compatible. Also, this will require project managers to integrate existing systems with the newly built systems.

4- **Cloud Computing:** it is a remote server that allows a project manager to store, manage, and process data, as well as enabling access to these data and files that are being stored in the cloud from any possible device. Cloud computing's purpose is to ease the use and share of information and to provide flexibility. However, the project manager's role, in this case, doesn't change knowing that there will be tracking, communicating, and reporting of the performances.

5- **Cyber Security:** since most processes, models, and frameworks will be shifted from traditional to technological; it is important to have extreme cybersecurity systems. Knowing that cyberattacks are increasing, and are threatening the cyberworld that could be destroyed by these attacks. Cybersecurity is a significant area in project management because one security breach could cost a lot to be fixed. Therefore, this area must be constantly monitored and the access to confidential information must be limited.

These elements are also seen as opportunities that will provide speed in different project management processes, but also considered as challenges in that fall under the accountability and responsibility of project managers and their project teams.

The table below shows the main differences between project management before the 4th industrial revolution and project management after the 4th industrial revolution.

Project Management Before 4.0	Project Management After 4.0
Moderate use of technology	High use of technology
Inflexible	flexible
Medium speed	High speed
Unadaptable	Adaptable

2.4. Challenges and Opportunities in Implementing the 4th Industrial Revolution

With all the rapid and constant changes, the fourth industrial revolution places a great promise as well as a great peril. Here are the opportunities and challenges of implementing the 4th industrial revolution (Xu, David & Kim 2018):

2.4.1. 4th Industrial Revolution Opportunities

- There will be an improved level of productivity in both social and economic aspects. For the economic aspect, new products and services will emerge which will attract investments and increase competitiveness. Where in the social aspect it will be impacted positively as a result of the improving economy; knowing that these two aspects are interrelated. Furthermore, new job opportunities will arise due to the emerging of new markets. Not to mention that foreign direct investments allow investors to have their own companies which will increase employment; therefore, it will boost the economy as well as the quality of individuals' lives (Marr 2018).
- Great developments of technology which will ease some of the process and practices. This includes the governance role of project managers through tracking systems, decentralized decision-making done by autonomous systems, and the storage of data that will be through the cloud computing system which will be accessible for the authorized people at any time and any place.
- Lower barriers between countries or even markets, which create an interconnected community that facilitates the gain of knowledge and skills from different nations. Also, it enables project managers to supervise and manage processes that are located overseas.
- More creativity and innovations used in different industries (e.g. education and healthcare).
- Creation of new markets and organizations that are concerned with the internet of things systems (IoT), artificial intelligence (AI), virtual reality systems (VR), and many more. Knowing that these leading systems will be the future of all organizations.

2.4.2. 4th Industrial Revolution Challenges

- Even though there will be new markets and job opportunities, however, some areas and departments will replace some manual jobs that are performed by humans with

autonomous machine systems which will result in lowers costs for the organization but at the same time will lessen the job opportunities for the human workforce.

- There will be increased levels of cybercrimes and theft of data by hacking cloud computing systems where all important data is being stored. These malicious activities lead to many losses such as loss of confidential information and loss of money; as well as process manipulation and blackmailing activities to get ransom in return.
- As the developments of technologies and systems come along with the 4th industrial revolution; there will be a significant impact on core businesses that have been operating for a long time and haven't been changed. These impacts on those businesses are coming from the change-driven environment that we live in today. For example, film-based cameras that have been abandoned and replaced by digital cameras, and digital cameras being replaced by phone cameras that have the same characteristics of a digital camera but easier to carry.
- Increased levels of manipulations and ethical issues since there will be huge dependence on robots; knowing that robots and machines are computed which means they lack the sense of moral reasoning (UNIDO 2018).
- There will be organizations or individuals who will resistant to change, which will result in operating and performing tasks in the same traditional way. With the era of the fourth industrial revolution, organizations that cannot adapt to the rapid changes and keep up with them might come to an end.

2.5. Conceptual Framework

A conceptual framework is an analytical tool that is considered to be an outline that clarifies how the research of the thesis is being conducted, as well as how the research problem is being explored. Also, it acts as a guide to understand the main purpose of the research and to stay on track. Conceptual frameworks explain the relationship between the main concepts or the main variables mentioned in the research. Mostly, they are expressed in diagrams (Adom, Hussein & Joe 2018). As for this research paper, the main concepts that are being discussed are project management, the fourth industrial revolution, and leadership. The framework/diagram below shows the different types of variables involved and the relationship between these variables.

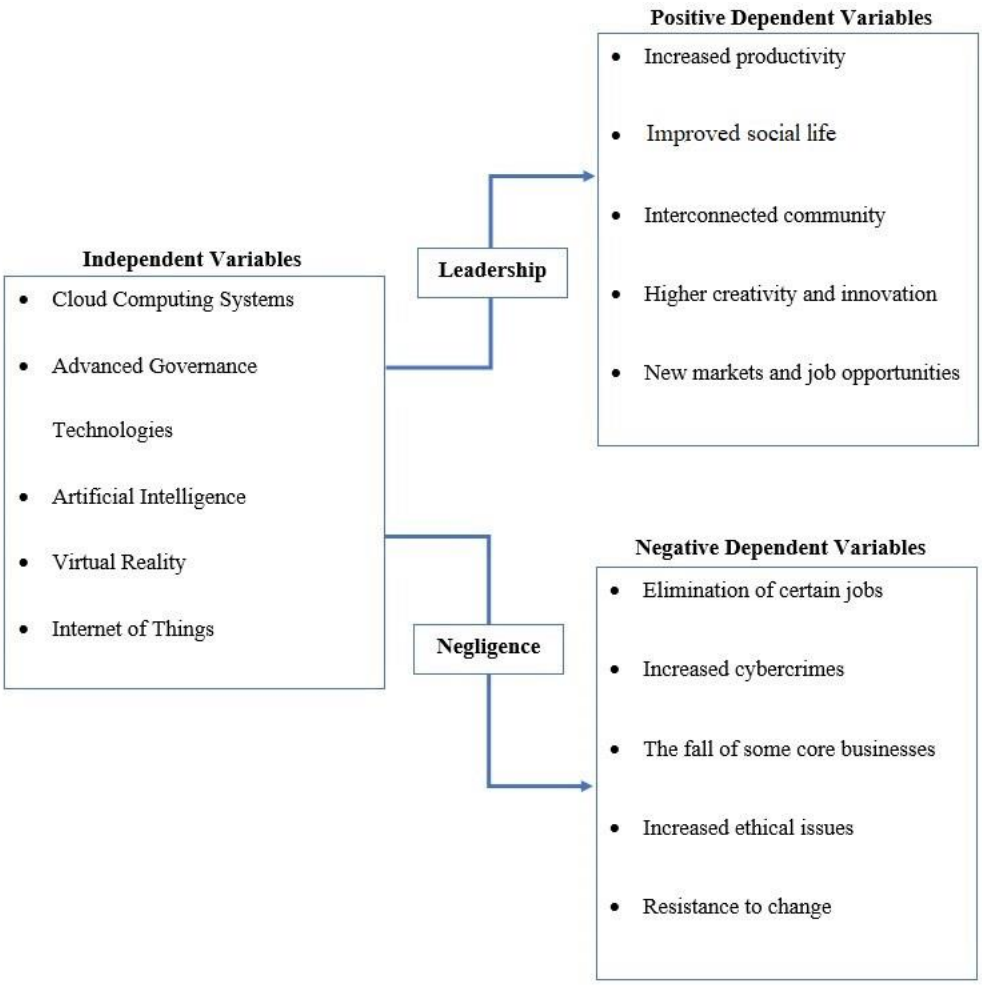


Figure 8 - Conceptual Framework of the Fourth Industrial Revolution, Project Management and Leadership

Variables, in this case, are best defined as measurable characteristics, and in the framework shown above, there are three variables involved which are independent, dependent variables, and moderator variables. The independent variables are also known as the cause variables because they are affecting dependent variables; when dependent variables are known as the effect variables because they are affected by the independent variables (the cause). Whereas moderator variables affect the relationship between both independent and dependent variables by directing the independent variables to cause some kind of effect on the dependent variables (Agravante 2018).

In this conceptual framework, the independent variables are the different advanced systems that adopt the requirement of the fourth industrial revolution which are:

- **Cloud Computing Systems:** cloud computing systems help project managers and their employees to store their files and data in the cloud, and to be able to access these files using any device anywhere and anytime.

- **Advanced Governance Technologies:** instead of being personally in the project sites, project managers can manage and govern projects through different devices no matter where they are.
- **Artificial Intelligence (AI):** autonomous systems and machines that perform certain jobs without the intervention of project managers or employees. For example, instead of having employees analyzing the progress of a project and evaluating its outcomes; there will be autonomous machines who will be capable of preparing a complete and integrated report with all the tasks that have been performed, by who, and how efficiently they have been accomplished and completed.
- **Virtual Reality (VR):** virtual reality will take place in designing a project, as it will create a simulation of what the project will look like. This is achieved by different types of devices such as VR headsets, eye-glasses, or even gloves. This system enables project managers to make changes before starting to work on the project especially if it was a huge project.
- **Internet of Things (IoT):** this enables all systems and devices to be connected in a way that project managers and employees are constantly updated if any changes occur in the project lifecycle, as well as achieving a higher speed than usual when it comes to managing sequential processes or reporting.

Whereas the dependent variables shown in the framework are the effects that resulted from the advanced systems, and they are divided into two which are positive dependent variables and the negative dependent variables:

Positive Dependent Variables:

- **Increased productivity:** the technologies and systems discussed above are going to facilitate the processes of project management, whether they were monitoring, tracking, or even reporting. These facilitated processes will result in increased productivity that is coming from the effectiveness and efficiency of the work being performed.
- **Improved social life:** advanced systems and technologies will affect the economy as well, which will affect the social life of people. Foreign direct investments will increase due to the developments of project management processes in a certain area or nation, and this will help in creating a prosperous economy and improving social life.
- **Interconnected community:** the ease of communication is another major effect that makes it possible for project managers to keep up with the projects' progress by

communicating with employees, stakeholders, or even suppliers through different devices by on-time voice calls, on-time video calls, or texting.

- **Higher creativity and innovation:** the mentioned systems will also encourage creativity and innovation when it comes to project management tasks and duties. This will allow project managers and their teams to think outside the box and come up with exceptional ideas to help them perform tasks more effectively and efficiently.
- **Newmarket and job opportunities:** as mentioned earlier, there will be more interest to invest in a country or a market that is moving ahead towards the 4th industrial revolution requirements which will result in more companies and organizations. Having more companies and organizations will result in creating new job opportunities.

Negative Dependent Variables:

- **Elimination of certain jobs:** since there will be autonomous machines that will be performing certain jobs, some manual jobs -usually routine-based jobs- will be eliminated and taken away from humans to be performed by some systems. For example, collecting data and analyzing processes.
- **Increased cybercrimes:** in the 4th industrial revolution, there is high dependency and reliance on cloud computing systems and digitization. This increases the risk of cybercrimes that are done by hackers which will result in data loss and financial loss.
- **The fall of some core businesses:** some core businesses that are considered to be traditional will not fit the requirements of the 4th industrial revolution, and this will bring these businesses to an end.
- **Increased ethical issues:** since there will be autonomous systems performing some jobs, manipulation could happen because these systems are programmed to do jobs whether it was ethical or unethical; knowing that these systems are unaware of such issues. For example, giving false data about the project.
- **Resistance to change:** some employees or even organizations might feel that they cannot adapt to these changes, and this will result in losing track and staying behind.

Moving to moderator variables, the moderator variables, in this case, are leadership and negligence.

Leadership is the moderator variable between independent variables and positive dependent variables because leadership skills influence employees to act in a certain way and motivate them to keep up with the requirements of the 4th industrial revolution by learning to use new

systems and technologies and being adaptive to change. The most important skills that will allow project management professionals to cope with the requirements of the 4th industrial revolution are:

- **Motivation:** project managers influence employees' behavior and performance; therefore, they are capable of motivating or demotivating employees to use or learn how to use the new systems that are resulting from the 4th industrial revolution requirements and necessities.
- **Positivity:** spreading positive thoughts creates a positive atmosphere. When it comes to positivity, project managers must inform their teams on the benefits of the 4th industrial revolution systems and technologies, and how it will result in achieving efficiency and effectiveness.
- **Creativity:** project managers should emphasize the idea of creativity that comes along with the era of the 4th industrial revolution, and reinforce the use of it as long as it will facilitate project management processes whether it was communication or project management.
- **Feedback:** giving constant feedback is important in the implementation of these new systems because it directs employees and encourages them to do better.
- **Commitment:** being committed to the aims and objectives of projects that promote innovations and advancements.

Whereas negligence is the failure to take good care of the changes and things that are going around, and it is the moderator variable between independent variables and negative dependent variables; because negligence and lack of interest will result in having employees or an entire organization that is not updated and not aware of what these systems are capable of, or it could create project managers who neglect the importance of human personnel.

The conceptual framework discussed above is aligned with the research hypothesis which is about achieving a balance between deploying leadership skills and implementing the 4th industrial revolution requirements that will result in having a smooth workflow in project management processes that takes less time but achieves high productivity

The table below is a summary table from different authors to review the elements recognized in the conceptual framework:

Author	Title	Main Findings
Meenakshi Nadimpalli (2017)	Artificial Intelligence Risks and Benefits	Artificial intelligence (AI) is best described as a double-edged sword, as it has its benefits and risks. One of the benefits of AI is improving the performance of hospital facilities by assisting physicians to recognize their patients' current status and who are most at risk. Whereas the risk could be taking over humans' vacancies (Nadimpalli 2017).
Sandeep Mukherji & Shashwat Srivastava (2016)	Pros and Cons of Cloud Computing Technology	Cloud computing system is one of the appealing technologies that all leading businesses use. It is a technology that allows to save data and recover it easily. Also, it creates centralization of data which means that authorized parties have access to these information using any device wherever they were (Mukherji & Srivastava 2016).
Gert Herold (2016)	Leadership in the Fourth Industrial Revolution	Within the era of the fourth industrial revolution, the role of leadership cannot be underestimated and it is important to choose the right leadership style in order to achieve positive outcomes (Herold 2016).
Min Xu , Jeanne M. David & Suk Hi Kim (2018)	The Fourth Industrial Revolution: Opportunities and Challenges	Neglecting the threats and the consequences of the technologies that are used in industry 4.0 could cause to cybercrimes and internet terrorism, an example to that is the Russian hackers who were able to steal $10 million from the customers' accounts of Citibank (Xu, David & Kim 2018).

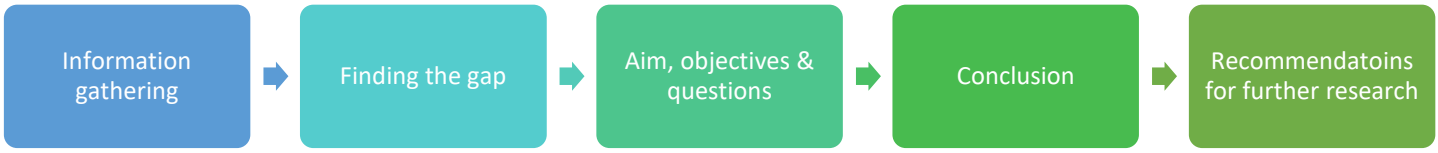
CHAPTER THREE: RESEARCH METHODOLOGY

3.1. Research Strategy

A research strategy is a systematic process that goes step-by-step. The research strategy is a plan that helps researchers to coordinate their thoughts and ideas of the main problem and then build it up with the data that have been collected through different methods (Jenny 2014).

The research strategy of this dissertation starts with in-depth searching and readings of journal articles and books that are related to project management, 4th industrial revolution, and leadership skills; and then comes the generating of research aim, research objectives, and research questions based on the gap that has been captured. This research is taking an inductive research approach because it starts with writing research questions and observing existing data and then building a hypothesis or a theory (Burney & Saleem 2008).

The following chapters will be discussing, analyzing, and interpreting the main findings that are collected through primary data which is the survey that has been conducted in this research and secondary data which is coming from existing journal articles and books that have been evaluated to be valid and reliable, as well as concluding the whole research and then provide recommendations for further research. The graphic below is a summary of the research strategy that has been followed in this research:



3.2. Research Design

The research design is an explanation of the research type; it could be qualitative research, quantitative research, mixed research and more. Every research paper needs at least one of these methods to be used in order to be reliable and to provide creditability. The most commonly used methods are qualitative and quantitative research methods; qualitative focuses more on characteristics and observations, whereas quantitative focuses more on numbers and statistical comparisons (Elkatawneh 2018).

The table below identifies some of the main differences between qualitative and quantitative research:

Qualitative	Quantitative
Non-numeric	Numeric
Observations	Measurements
Interviews	Surveys

In this research, the quantitative method had been conducted through surveys using "SurveyMonkey" that involve 15 questions that highlight the main concepts of the research that have been identified in the literature review, and the relationship between them. This method has been chosen because individuals have different views on the 4th industrial revolution impacts, the most important leadership skills for project managers, and how the previously mentioned concepts impact the project management profession, and this research is attempting to translate the findings into numbers and statistics. The question types that are used in the survey are demographic questions, open-ended questions, closed-ended questions, Likert scale questions, checkbox questions, and ranking questions.

The questionnaire has been designed based on the literature review, as there is a comparison between soft skills and hard skills to find out which set of skills is more important. Also, respondents have ranked some skills which are (communication, critical thinking, leadership, decision making, quality management) from the most important to the least important.

Moreover, respondents have given other leadership competencies and skills that are important in project management and clarified how they could be acquired, as well as deciding the level of impact of the 4th industrial revolution on project management and leadership. Even more, the questionnaire had 3 different statements to describe the fourth industrial revolution in order to see which statement that best describe this era.

Furthermore, respondents have shared the opportunities and challenges of the 4th industrial revolution in their point of view, and voted whether leadership is needed in this era or not. For those who agreed that leadership is needed, they have given examples of how leadership is taking place in the fourth industrial revolution.

Also, the questionnaire has a list of leadership skills which allows respondents to select more than one leadership skill that will be impacted by the 4th industrial revolution in the project

management field, as well as naming a form of implementation in project management that adopts the requirements of the fourth industrial revolution.

3.3. Sampling and Sample Size

Sampling is a concept to describe the representatives who have taken part in the research and are selected from a population. Sampling is beneficial because it helps researchers to get valuable information that will serve the research paper (Ajay & Micah 2014). The sampling technique used in this research is expert sampling, which is a sub-type of purposive sampling that is considered to be a non-probability sampling technique; meaning that it doesn't select representatives or participants in a random manner (Etikan & Bala 2017). The reason behind choosing expert sampling is because it allows the researcher to get answers from individuals who have the expert and knowledge about specific areas; and in this case, it is about the 4th industrial revolution, project management, and leadership.

This sampling targeted employees, leaders and project managers who work in different departments which are the information technology department, engineering department, and business management department; knowing that the respondents work in different organizations such as media, airlines, energy, and business organizations. The total number of survey respondents is 115 people, 65 respondents are working in Sharjah, 31 respondents are working in Dubai, and 19 respondents are working in Abu Dhabi.

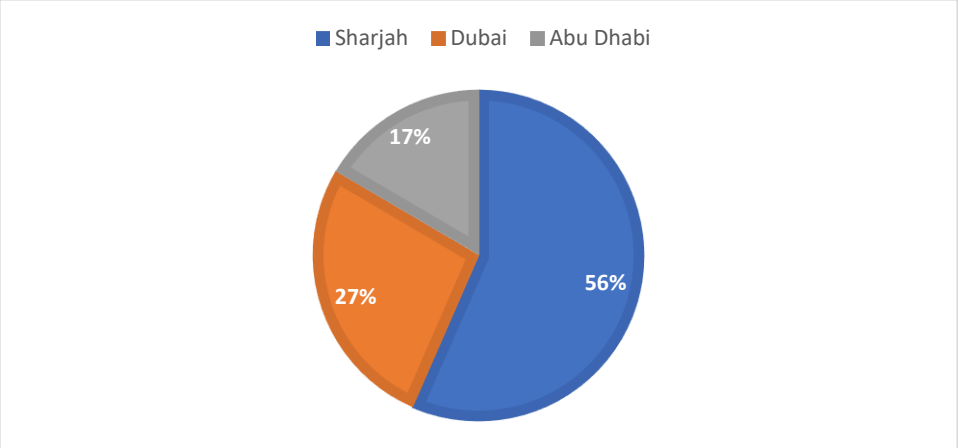
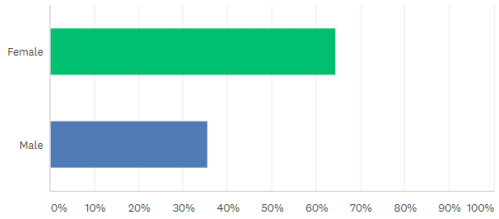


Figure 9 - Respondents Numbers and the Emirates they are Working In

CHAPTER FOUR: DATA ANALYSIS

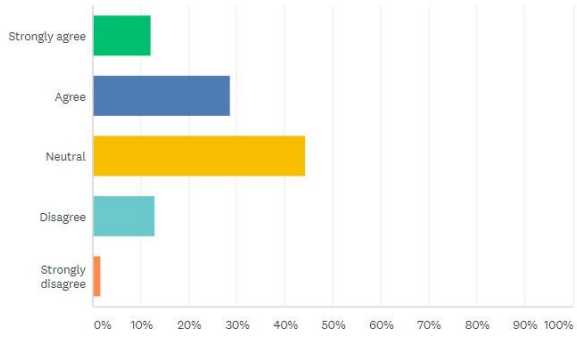
This chapter is to showcase the results of the surveys that have been conducted and to analyze the data that have been collected to compare and contrast. Starting with the first demographical question which is the gender; the female respondents take place in this research paper more than male respondents, 74 females and 41 males as shown in the chart below.



ANSWER CHOICES	RESPONSES	
Female	64.35%	74
Male	35.65%	41
TOTAL		115

Figure 10 - Question 1

The second question focuses on the skillset aspect, and it is a comparison between soft and hard skills to know what respondents think that works best or more important. This question is a statement that says soft skills are important than hard skill; as for this question, Likert scale style has been used, and apparently, as shown in the figure below, 44.35% of the respondents think that both types of skills are equally important by choosing the answer "Neutral", and it takes the highest rate which represents the majority. Whereas 28.70% of the respondents chose "Agree" which is the second-highest rate out of all the choices, and thirdly comes the answer "Disagree" that got 13.04%.



ANSWER CHOICES	RESPONSES	
Strongly agree	12.17%	14
Agree	28.70%	33
Neutral	44.35%	51
Disagree	13.04%	15

Figure 11 - Question 2

The third question is a ranking question of the most important skills that a project manager should acquire to the least. According to the survey results, the following is the order of the importance of the skills starting from the most important to the least:

1- Leadership
2- Communication
3- Critical Thinking
4- Decision Making
5- Quality Management

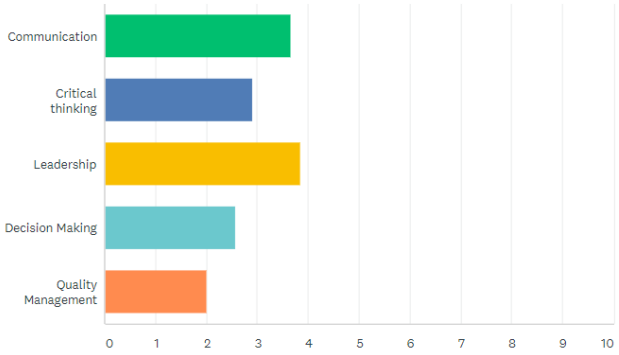


Figure 12 - Question 3

The fourth question asks respondents to give other leadership competencies that are necessary for the project management profession; and the most frequent answers were effective communication, employee empowerment, teamwork, confidence, and time management.

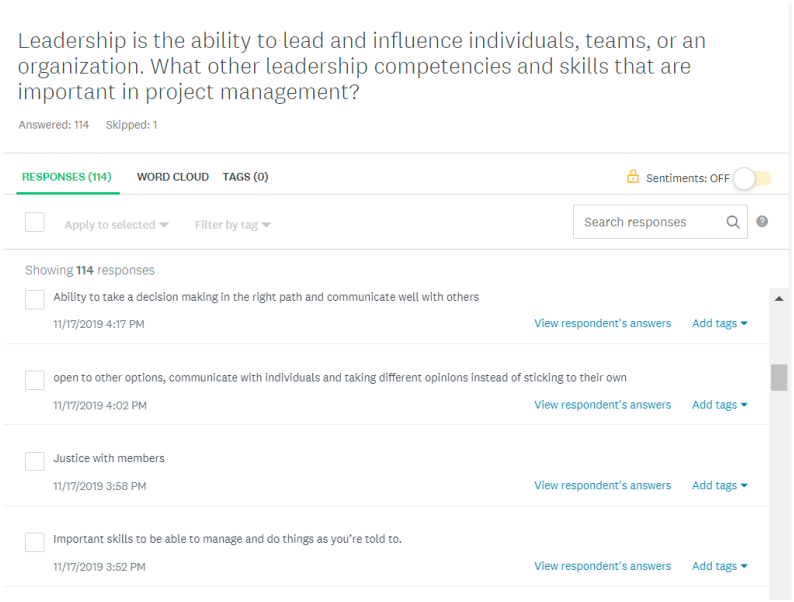


Figure 13 - Question 4

The fifth question is about how the mentioned competencies in the previously asked question can be acquired, and there were variety and disparity in responses between training programs, dealing with people, and naturally acquired.

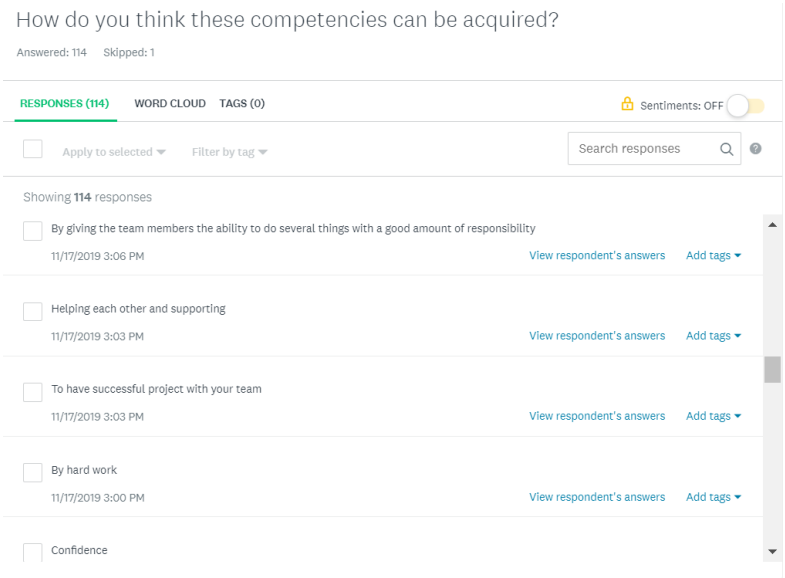
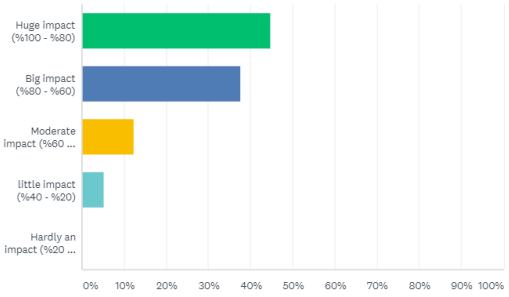


Figure 14 - Question 5

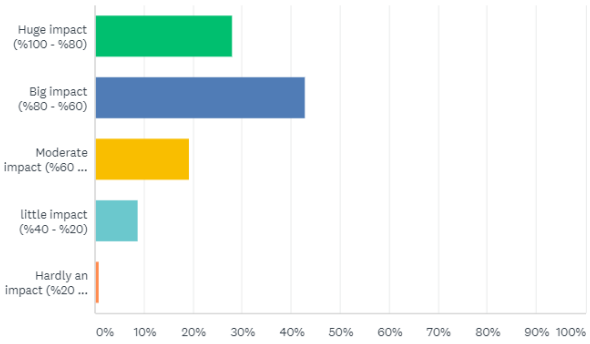
The sixth question is another Likert scale question about how strong does the fourth industrial revolution impact the project management profession, and the majority have chosen “Huge Impact”, followed by “Big Impact”, and the third most chosen choice is “Moderate Impact”.



ANSWER CHOICES	RESPONSES	
Huge impact (%100 - %80)	44.74%	51
Big impact (%80 - %60)	37.72%	43
Moderate impact (%60 - %40)	12.28%	14
little impact (%40 - %20)	5.26%	6
Hardly an impact (%20 - %0)	0.00%	0
TOTAL		114

Figure 15 - Question 6

The seventh question is also a Likert scale question on how strong does the fourth industrial revolution impact leadership, and the majority have chosen “Big Impact”, followed by “Huge Impact”, and the thirdly chosen choice is “Moderate Impact”.

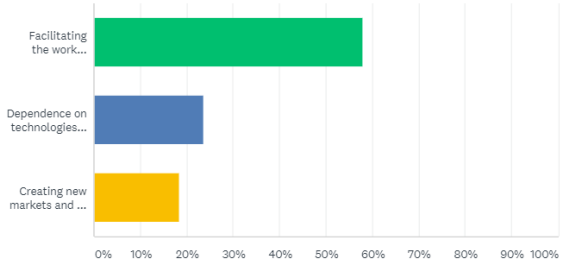


ANSWER CHOICES	RESPONSES	
Huge impact (%100 - %80)	28.07%	32
Big impact (%80 - %60)	42.98%	49
Moderate impact (%60 - %40)	19.30%	22
little impact (%40 - %20)	8.77%	10
Hardly an impact (%20 - %0)	0.88%	1
TOTAL		114

Figure 16 - Question 7

The eighth question is about choosing the statement that best describes the fourth industrial revolution, and it is as follows:

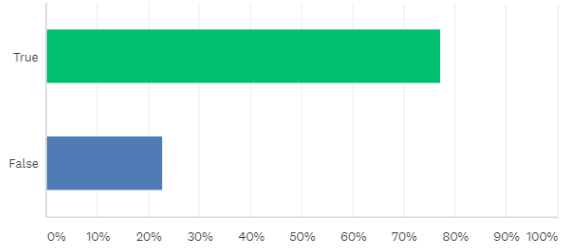
1- 57.89% have chosen “Facilitating the work process by using advanced technologies”
2- 23.68% have chosen “Dependence on technologies more than humans”
3- 18.42% have chosen “Creating new markets and job opportunities”



ANSWER CHOICES	RESPONSES	
Facilitating the work processes by using advanced technologies	57.89%	66
Dependence on technologies more than humans	23.68%	27
Creating new markets and job opportunities	18.42%	21
TOTAL		114

Figure 17 - Question 8

The ninth question is a true or false question about a statement that says that the fourth industrial revolution's opportunities are more than its challenges; and according to the chart below, 88 people have chosen "True" which is around 77% of the total respondents.



ANSWER CHOICES	RESPONSES	
True	77.19%	88
False	22.81%	26
TOTAL		114

Figure 18 - Question 9

The tenth question is an open-ended question about the fourth industrial revolution opportunities, and the most frequent answers were:

- Transforming traditional work to something creative and system-based
- Achieving efficiency and effectiveness
- Accomplishing more tasks in less time

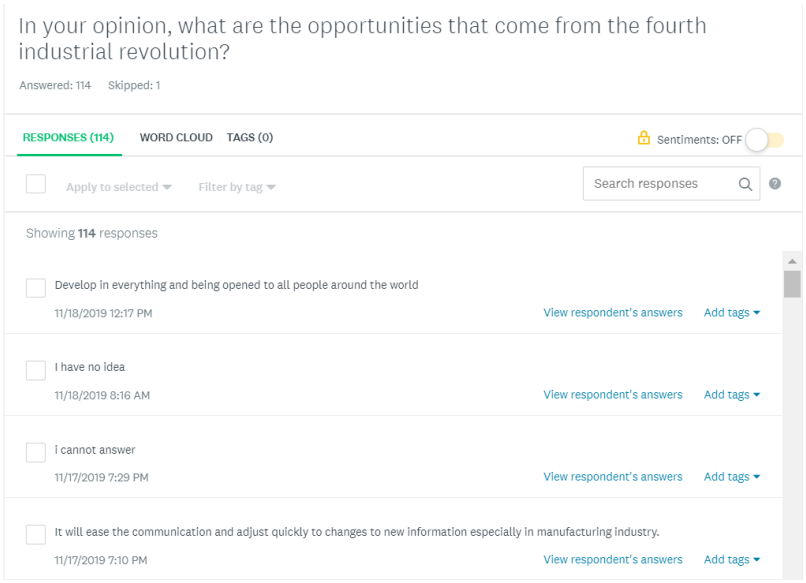


Figure 19 - Question 10

The eleventh question is another open-ended question on the fourth industrial revolution challenges, and the common answers were:

- A huge reliance on systems rather than using human skills
- Machine damage which could cause the whole process to be stopped or paused
- Fewer job opportunities

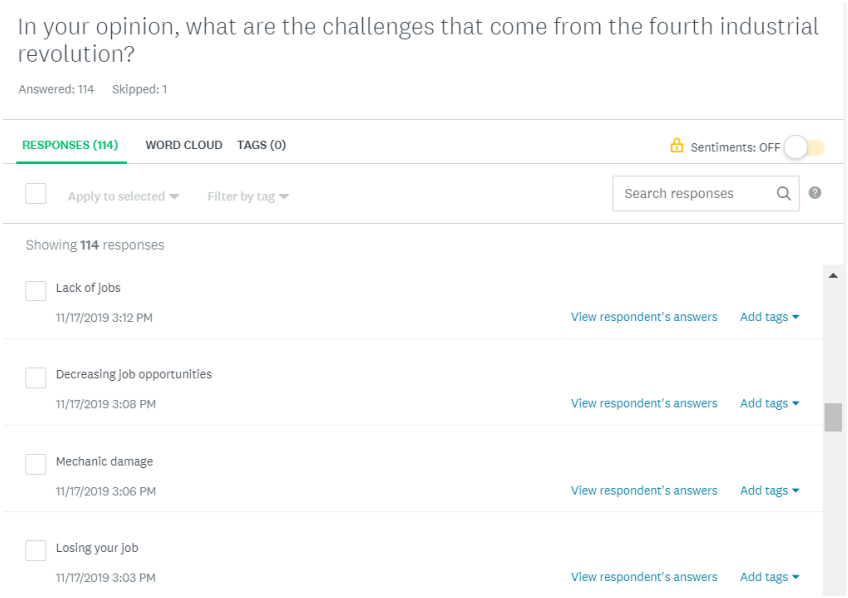
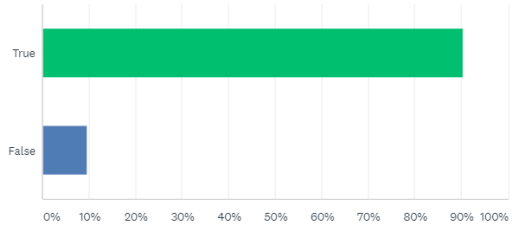


Figure 20 - Question 11

The twelfth question is a true or false question about a statement that says that leadership is needed in the era of the fourth industrial revolution, and around 90% of the respondents have answered with “True”, as shown in the chart below.



ANSWER CHOICES	RESPONSES	
True	90.35%	103
False	9.65%	11
TOTAL		114

Figure 21 - Question 12

The thirteenth question is an open-ended question about the respondents' opinions on how they think that leadership will be taking place in the fourth industrial revolution in the context of project management. The most common answers were:

- By motivating and influencing the team to master the use of the new systems that are resulting from the 4th industrial revolution.
- By tracking the project management processes through the new systems.
- By developing systems and making them work to the team and organization's benefit by using them wisely.

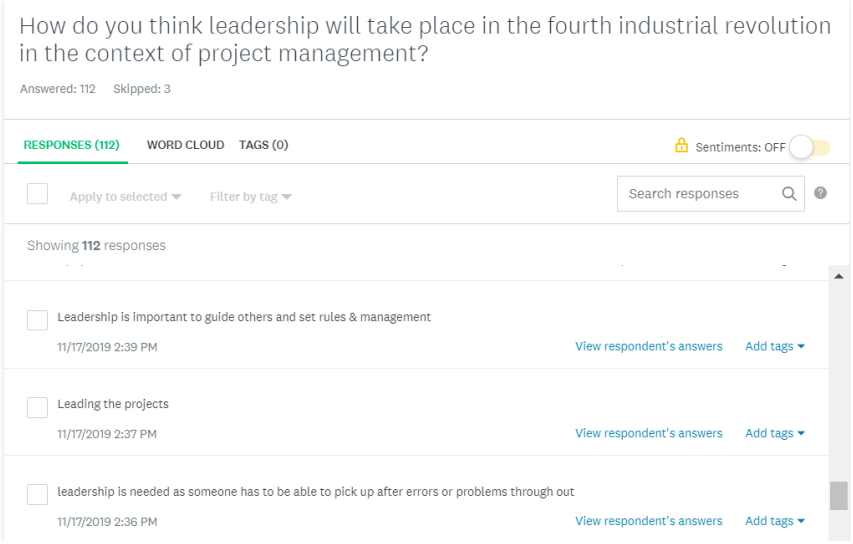
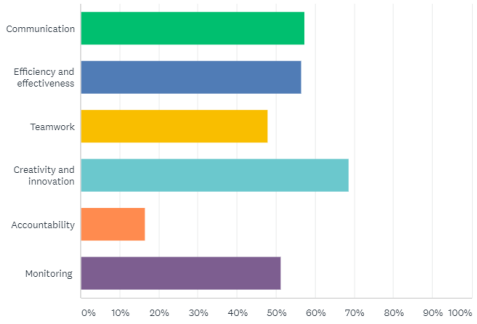


Figure 22 - Question 13

The fourteenth question is a checkbox question where respondents choose more than one choice, and it is about what leadership skills that will be impacted by the fourth industrial revolution. There is no option left unchosen, however, here is the order of the skills from most impacted to lowest:

1- Creativity and innovation
2- Communication
3- Efficiency and effectiveness
4- Monitoring
5- Teamwork
6- Accountability



ANSWER CHOICES	RESPONSES	
Communication	57.39%	66
Efficiency and effectiveness	56.52%	65
Teamwork	47.83%	55
Creativity and innovation	68.70%	79
Accountability	16.52%	19
Monitoring	51.30%	59
Total Respondents: 115		

Figure 23 - Question 14

The fifteenth and the last question is about providing an example of whether it was existing or a future plan of implementation in project management that adopts the requirements of the 4th industrial revolution; the answers were:

- Connected systems between devices to provide clear and full reports
- Having systems to show the tasks that have been accomplished already and the ones that have not been accomplished yet
- Having tracking technologies to stay updated all the time and everywhere
- Storage computing systems that allow project managers and their teams to store files in them and access them anytime.

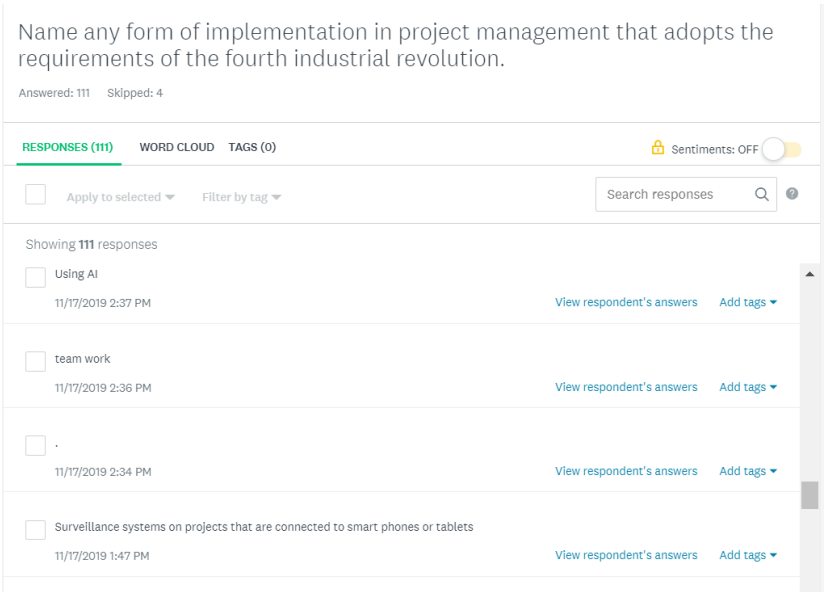


Figure 24 - Question 15

CHAPTER FIVE: SPSS ANALYSIS

5.1. Correlation Analysis

Correlation analysis is a statistical method that shows the relationship between two numerically measured variables in order to study the strength between them (Senthilnathan 2019). In this study, the correlation analysis is utilized to show the relationship between project management skills and the 4th industrial revolution. The benefit and the main goal of this correlation analysis is to understand which project management skill is most important in the 4th industrial revolution.

Table 1

How strong do you think fourth industrial revolution impacts project management?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Huge impact (%100 - %80)	51	44.3	44.7	44.7
	Big impact (%80 - %60)	43	37.4	37.7	82.5
	Moderate impact (%60 - %40)	14	12.2	12.3	94.7
	little impact (%40 - %20)	6	5.2	5.3	100.0
	Total	114	99.1	100.0	
Missing	System	1	.9		
Total		115	100.0		

Figure 1

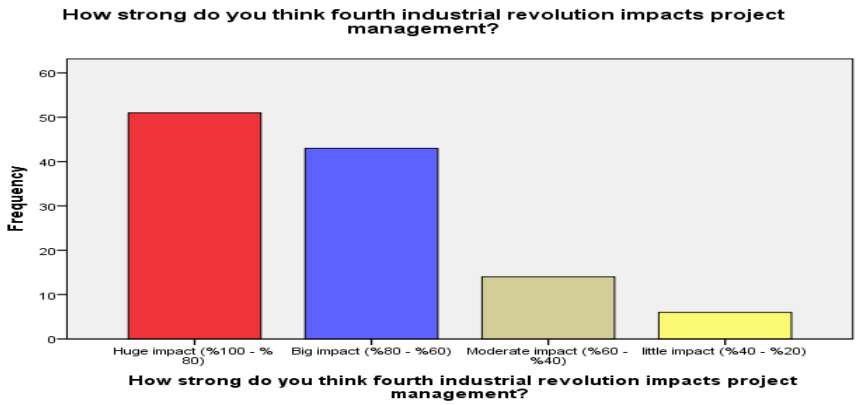


Table and figure 1 above shows the frequency distribution of how fourth industrial revolution impacts project management, 51(44.3%) of the people who responded to this survey said fourth industrial revolution has a huge impact on project management, 43(37.4%) of the people who responded to this survey said fourth industrial revolution has a big impact on project management, 14(12.2%) of the people who responded to this survey said fourth

industrial revolution has a moderate impact on project management, and 6(5.2%) of the people who responded to this survey said fourth industrial revolution has little impact on project management. In this survey, it would be concluded that the 4th industrial revolution has a significant impact on project management since the survey question support this with over 81% of respondent agreeing to this statement. This proves that the fourth industrial revolution is highly impacting the project management processes and performances in terms of communication, quality, supervision and so on.

Table 2

How strong do you think fourth industrial revolution impacts leadership?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Huge impact (%100 - %80)	32	27.8	28.1	28.1
	Big impact (%80 - %60)	49	42.6	43.0	71.1
	Moderate impact (%60 - %40)	22	19.1	19.3	90.4
	little impact (%40 - %20)	10	8.7	8.8	99.1
	Hardly an impact (%20 - %0)	1	.9	.9	100.0
	Total	114	99.1	100.0	
Missing	System	1	.9		
Total		115	100.0		

Figure 2

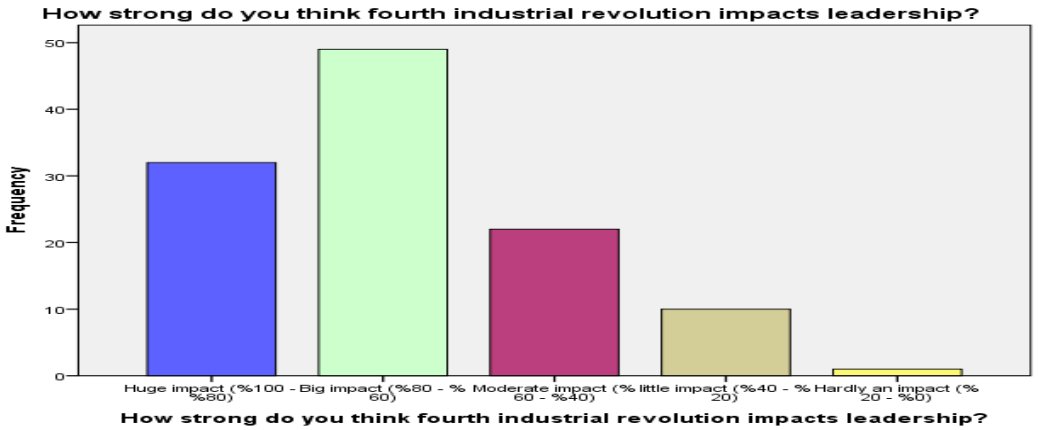


Table and figure 2 above shows the frequency distribution of how fourth industrial revolution impacts leadership, 32(27.3%) of the people who responded to this survey said fourth industrial revolution has a huge impact on leadership, 49(42.6%) of the people who responded to this survey said fourth industrial revolution has a big impact on leadership, 22(19.1%) of the people who responded to this survey said fourth industrial revolution has a

moderate impact on leadership, 10(8.7%) of the people who responded to this survey said fourth industrial revolution has little impact on leadership, and 1(.9%) of the people who responded to this survey said fourth industrial revolution has little impact on leadership. In this survey, it would be concluded that the 4th industrial revolution has a significant impact on leadership since the survey question support this with over 69% of respondent agreeing to this statement. Which proves that the fourth industrial revolution is impacting the leadership styles in today's era in order to keep up with the changes that are happening in our surroundings, and to make the best use out of these technological changes in a way that serves the organizations and the community.

Table 3

What is the best statement to describe the fourth industrial revolution?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Facilitating the work processes by using advanced technologies	66	57.4	57.9	57.9
	Dependence on technologies more than humans	27	23.5	23.7	81.6
	Creating new markets and job opportunities	21	18.3	18.4	100.0
	Total	114	99.1	100.0	
Missing	System	1	.9		
Total		115	100.0		

Figure 3

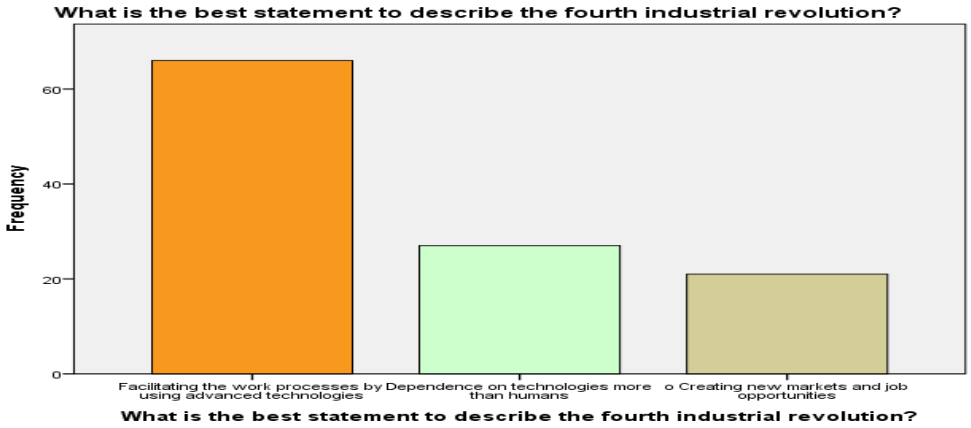


Table and figure 3 above shows the frequency distribution of best statement to describe the fourth industrial revolution, 66(57.4%) of the people who responded to this survey said best

statement to describe fourth industrial revolution is facilitating the work processes by using advanced technologies, 27(23.5%) of the people who responded to this survey said best statement to describe fourth industrial revolution is dependence on technologies more than humans, 21(18.3%) of the people who responded to this survey said best statement to describe fourth industrial revolution is creating new markets and job opportunities. In this survey, it would be concluded that facilitating the work processes by using advanced technologies is the best statement to describe 4th generation industrial revolution since the survey question support this with over 57% of respondent agreeing to this.

Table 4

The fourth industrial revolution's opportunities are more than its challenges.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	True	88	76.5	77.2	77.2
	False	26	22.6	22.8	100.0
	Total	114	99.1	100.0	
Missing	System	1	.9		
Total		115	100.0		

Figure 4

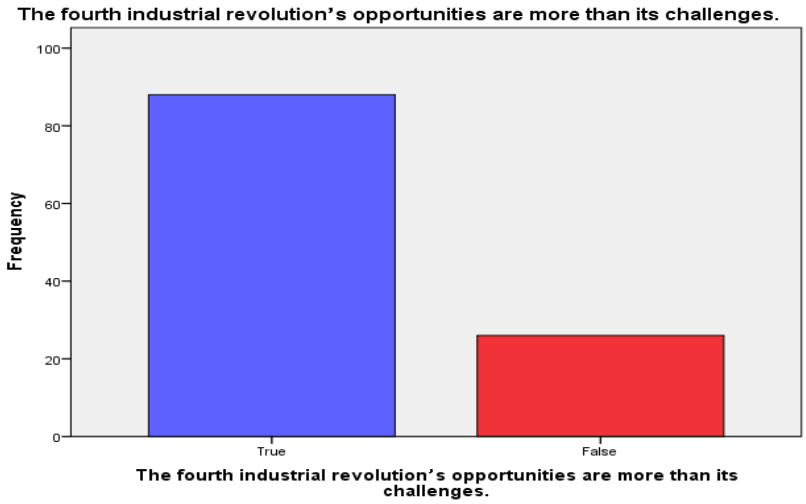


Table and figure 4 above shows the frequency distribution of "the fourth industrial revolution's opportunities are more than its challenges", 88(76.5%) of the people who responded to this survey said fourth industrial revolution's opportunities are more than its challenges, 26(22.6%) of the people who responded to this survey said fourth industrial revolution's opportunities are more than its challenges.

Table 5

Leadership is needed in the era of the fourth industrial revolution.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	True	103	89.6	90.4	90.4
	False	11	9.6	9.6	100.0
	Total	114	99.1	100.0	
Missing	System	1	.9		
Total		115	100.0		

Figure 5

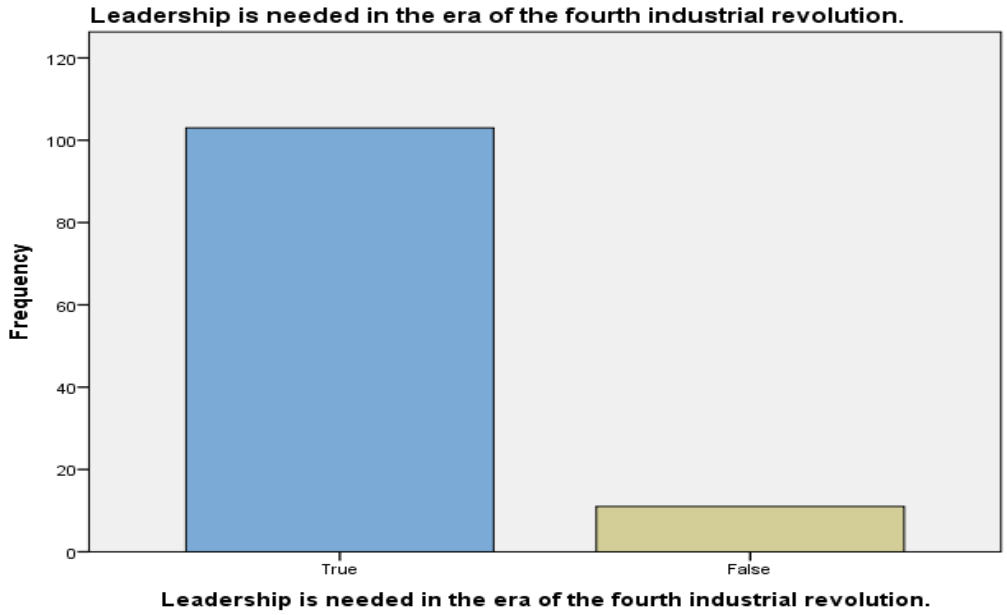


Table and figure 5 above shows the frequency distribution of "leadership is needed in the era of the 4th industrial revolution", 103(89.6%) of the people who responded to this survey said leadership is needed in the era of the 4th industrial revolution, 11(9.6%) of the people who responded to this survey said leadership is needed in the era of the 4th industrial revolution.

Table 6

Relationship Between Project Management Skills and the 4th Industrial Revolution Rating

Correlations

		4th Industrial Revolution	Communication	Critical Thinking	Leadership	Decision Making	Quality Management
4th Industrial Revolution	Pearson Correlation	1	.029	.052	-.188*	.113	-.008
	Sig. (2-tailed)		.756	.583	.045	.229	.934
	N	115	115	115	115	115	115
Communication	Pearson Correlation	.029	1	-.256**	-.096	-.323**	-.351**
	Sig. (2-tailed)	.756		.006	.309	.000	.000
	N	115	115	115	115	115	115
Critical thinking	Pearson Correlation	.052	-.256**	1	-.356**	-.215*	-.294**
	Sig. (2-tailed)	.583	.006		.000	.021	.001
	N	115	115	115	115	115	115
Leadership	Pearson Correlation	-.188*	-.096	-.356**	1	-.275**	-.236*
	Sig. (2-tailed)	.045	.309	.000		.003	.011
	N	115	115	115	115	115	115
Decision Making	Pearson Correlation	.113	-.323**	-.215*	-.275**	1	-.088
	Sig. (2-tailed)	.229	.000	.021	.003		.351
	N	115	115	115	115	115	115
Quality Management	Pearson Correlation	-.008	-.351**	-.294**	-.236*	-.088	1
	Sig. (2-tailed)	.934	.000	.001	.011	.351	
	N	115	115	115	115	115	115

Table 6 above confirms that project management skill (communication) (b=.029, p=.756) shows that there is low or no correlation between them, it also shows that the relationship is not significant statistically since .756>.05.

The factor project management skill (critical thinking) (b=.052, p=.583) shows that there is low or no correlation between critical thinking skills and the 4th industrial revolution, it also shows that the relationship is not significant statistically since .583>.05.

The table also shows that project management skill (leadership) (b=-.188, p=.045) shows that there is a moderate correlation between the project management skill (leadership) and the 4th industrial revolution, it also shows that the relationship is statistically significant since .045<.05.

The table also shows that project management skill (decision making) (b=.113, p=.229) shows that there is low or no correlation between project management skill (decision making) and the 4th industrial revolution, it also shows that the relationship is not statistically significant since .229>.05.

The table also shows that project management skill (quality management) (b=-.008, p=.934) shows that there is low or no correlation between project management skill (quality management) and the 4th industrial revolution, it also shows that the relationship is not statistically significant since .934>.05.

Table 7

What leadership skills of a project manager that will be most impacted in the 4th industrial revolution era?

	Leadership Skills	Selection Frequency
1	Communication	66
2	Efficiency and effectiveness	64
3	Teamwork	54
4	Creativity and innovation	77
5	Accountability	19
6	Monitoring	59

Table 7 above shows the frequency distribution of "What leadership skills of a project manager that will be most impacted in the 4th industrial revolution era", 66 of the people who responded to this survey said communication is the skill that will be impacted in 4th industrial revolution the most, 64 of the people who responded to this survey said efficiency and effectiveness is the skill that will be impacted in 4th industrial revolution the most, 54 of the people who responded to this survey said teamwork is the skill that will be impacted in 4th industrial revolution the most, 77 of the people who responded to this survey said creativity and innovation is the skill that will be impacted in 4th industrial revolution the most, 19 of the people who responded to this survey said accountability is the skill that will be impacted in 4th industrial revolution the most, and 59 of the people who responded to this survey said monitoring is the skill that will be impacted in 4th industrial revolution the most. In this survey, it would be concluded that innovation and creativity is the leadership skill of project managers that will be impacted the most in the 4th industrial revolution.

5.2. Regression Analysis

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.204[a]	.042	.007	.918	.042	1.192	4	110	.319

R-squared is called coefficient of determination which indicates the percentage of variance in dependent variable that could be explained by the independent variable.

The r2 (coefficient of determination) = .042 shows that 4.2% of the variation in leadership skills rating can be explained by the independent variables (Communication, Critical Thinking, Decision Making, and Quality Management). This shows that there is very low explanation of the dependent variables by the independent variables.

ANOVA[a]

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	4.015	4	1.004	1.192	.319[b]
	Residual	92.646	110	.842		
	Total	96.661	114			

The overall model has does not have significant value of .319>.05 which means that the overall model is not statistically significant.

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	.800	.930		.860	.392
	Communication	.150	.095	.205	1.583	.116
	Critical thinking	.133	.082	.196	1.618	.108
	Decision Making	.189	.093	.234	2.031	.045
	Quality Management	.107	.091	.142	1.171	.244

The table above shows the output of multiple regression analysis for analyzing the effect of independent variables (Communication, Critical Thinking, Decision Making, and Quality Management) on leadership skills rating.

The regression analysis shows the regression coefficient of factor “Communication” (b=.150, p-value=.116) has a positive value of .150 which shows that for each unit’s increase in communication rating, it predicts that there is .150 increase in units of leadership skills rating.

The result of the regression is not statistically significant at .116>.05, which means that communication does not have statistically significant effect at this level.

The regression analysis shows the regression coefficient of factor “Critical Thinking” (b=-.133, p-value=.108) has a positive value of .133 which shows that for each unit’s increase in critical thinking rating, it predicts that there is .133 increase in units of leadership skills rating.

The result of the regression is not statistically significant at .108>.05, which means that critical thinking does not affect statistically significantly at this level.

The regression analysis shows the regression coefficient of factor “Decision Making” (b=.189, p-value=.045) has a positive value of .189 which shows that for each unit’s increase in decision making, it predicts that there is .189 increase in units of leadership skills rating.

The result of the regression is statistically significant at .045>.05, which means that decision making does affect statistically significantly at this level.

The regression analysis shows the regression coefficient of factor “Quality Management” (b=.107, p-value=.244) has a positive value of .107 which shows that for each unit’s increase in quality management, it predicts that there is .107 increase in units of leadership skills rating.

The result of the regression is not statistically significant at .244>.05, which means that quality management does not affect statistically significantly at this level.

The chart below shows P-P plot of the dependent variable and the standardized residual. The graph shows that there is an upward trend between the dependent and the residual values as expected for a normality test, from the graph below we can conclude that the data used for this analysis is normally distributed.

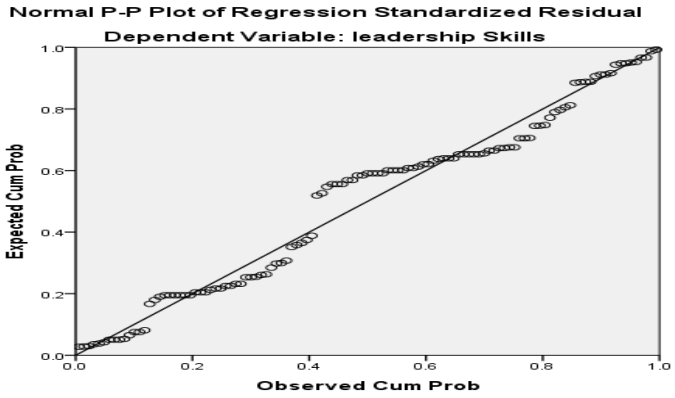


Figure 25 - P-P Plot of Regression standardized Residual

The chart below shows Scatter plot of the dependent variable and the standardized predicted value. The graph shows that there is partially linearity between the dependent and the predicted values as expected for a linearity test, from the graph below we can conclude that the data used for this analysis is linearly related.

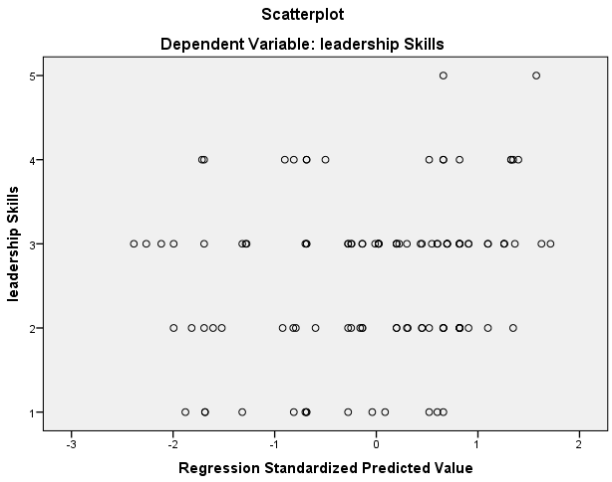


Figure 26 - ScatterPlot of Regression standardized predicted value

As mentioned earlier, independent variables (communication, critical thinking, decision making, and quality management) have an impact on leadership skills, but the level of impact differs.

CHAPTER SIX: DISCUSSION

This chapter involves the findings, their discussion, and interpretation, as it will include both primary and secondary research methods. As shown in the previous chapters; this research paper is discussing three different concepts that matter in today's world as they impact many organizations, their process, and their productivity level. These three main concepts are the 4th industrial revolution, the project management profession, and leadership skills. Each concept carries out a set of essential factors as these concepts are reflected through how these factors are being used and deployed.

The fourth industrial revolution took over the world today, as it resulted in major technological advancements and system developments that are now adopted by every contemporary and leading organization. Furthermore, the 4th industrial revolution places significant impacts on project management and leadership. In project management, the implementation of the 4th industrial revolution is going to change the way that processes work, as well as the efficiency and the productivity of the work that is accomplished. Whereas leadership is going to impacted by the 4th industrial revolution by impacting other leadership skills of a project manager like communication, decision making, and managing a project. According to the conducted surveys, leadership is essential in project management when implementing the fourth industrial revolution requirements. This shows that the majority of respondents agree that today's era is significantly influencing project management, as they agree that leadership holds an important role to achieve the requirements of industry 4.0 in the project management profession.

However, every concept or new development has its benefits and drawbacks; and the 4th industrial revolution could carry both but it primarily depends on how it is being deployed and to which scale it is being implemented. The benefits of the fourth industrial revolution are:

1- Facilitating the project management processes. An example of a way on how project management can be facilitated by implementing the 4th industrial revolution requirements is the implementation of blockchain technology. Blockchain technology is a decentralized transaction system that is also known as the cryptographic technology; it is called a blockchain because it consists of blocks and each block is a collection of data, these blocks are working in a linked and chronological process which creates a chain between these blocks of data. Blockchain technology is considered to be secure because it has

cryptographic data, cost-effective because it helps project managers and team members track their task completions which prevents time exceeding, and transparent because it allows all users to be aware of all the information being shared. Moreover, it takes a huge part in project management field when it comes to facilitating the processes; some of the ways of how blockchain impacts project management are:

- Saving files
- Sending reports
- Billing and payments
- Tracking task completion
- Monitoring project progress

Knowing that the files and information being shared is visible to all team members or users (How BlockChain Technology can Revolutionize Project Management? 2019).

2- Creating new markets and job opportunities as these systems need technicians and professionals to ensure security since they are mostly cloud computed. An example of an emerging occupation is "blockchain engineer" which is a software engineer but focused on the blockchain matter (Porru et al. 2017). Blockchain engineers can work in the project management field since the project management profession is adopting blockchain technology, which will definitely require an engineer who is an expert in this specific area to avoid any threats of losses and thefts.
3- The fourth industrial revolution will encourage creativity and innovation even more, as new technologies will be developed or even invented by organizations to keep up with the requirements of the new era and to sustain their position in the market or industry.

Proof of the mentioned benefits of the 4th industrial revolution is Amazon. Amazon is one of the leading companies in e-commerce that uses blockchain technology, cloud computing, artificial intelligence systems, and digital streaming through its subsidiary Amazon Web Services (AWS). AWS provides a cloud computing platform that allows organizations and companies to have secure storage to save their files and focus on their application services rather than the infrastructure as AWS will be taking care of this matter from procurement to software maintenance (AWS 2019). Moreover, Salesforce, the cloud-based software company is going to use Amazon's AI "Artificial Intelligence" technology in their call center services which will allow Salesforce to translate the customers' languages, turn their spoken words into texts, and analyze customers' attitude through their voices to evaluate satisfactory (Moore 2019).

While the 4th industrial revolution drawbacks are:

1- Replacing some employees with autonomous machines and smart systems to do certain jobs such as preparing a report or managing a project, which will result in eliminating some job opportunities that are occupied by humans. According to BBC News (2015), around 35% of the jobs in the UK are at a high probability of being computerized and system-based.
2- These autonomous machines and cloud computing systems may be defected and damaged, causing the work or some processes to be stopped and paused until this defect is detected and fixed which can take a very long time and disables progression. This also results in unethical manipulations knowing that these machines are doing what they are programmed to do.
3- Since there is a huge reliance on the internet of things systems (IoT) and cloud computing, the vulnerabilities increase. There is a lot of different malicious software that are being by professional hackers to have illegal access to the organizations' confidential data that eventually results in a financial and reputational loss (Champion 2019).

Moving to the second main concept which is project management; project management is the process of initiating, planning, executing, monitoring and controlling, and closing projects. These projects may differ in size and purpose depending on each organization's goals and objectives. A project manager is someone that successfully manages the project, resources, team, and processes (Duncan Haughy 2014). The managing of these different aspects requires certain skills to achieve effectiveness and productivity. According to the survey responses, the most important skill that is needed to be practiced by project managers is leadership, followed by communication, and the third most important skill that has been chosen by the majority is critical thinking. Project management consists of different processes that are impacted by the fourth industrial revolution; the major impacts that this era has on the project management profession are:

1- Facilitating the communication between the project manager and the team, as well as the sharing of the important files and data that can be stored through the cloud computing systems; which enables the project manager the team to access the cloud any time and through any device.
2- The reporting process is easier as the systems used will be collecting and updating the data automatically, this enables the project manager and the team to keep up with the

progression process, the members who are assigned to do each task, and the deadline of each task.

3- The project manager will be able to manage and have an eye on the project and its processes while being anywhere in the world by using cloud systems that enable the project manager to have a live or on-time management rather than being personally in the project site.
4- The new autonomous machines and systems are programmed and computed to do the work without the interference of humans. This will result in fast and speedy processes that will prevent any delays and maintain the progress level of the project.

The third main concept is leadership; as mentioned above, the majority of respondents have chosen leadership as the most important skill that needs to be acquired by project managers. There is no denying in the level of importance of each skill that has been mentioned in the survey, however, the fact that leadership is chosen by the majority of respondents emphasizes the importance of leadership in project management because leaders have a strong sense of influencing the way that their employees work and behave. Moreover, the majority of respondents are neutral on the statement that is about soft skills being more important than hard skills, however, the second most chosen answer is "Agree" which means that most respondents either think that soft skills and hard skills are equally important or agreeing with the statement of soft skills being more important; knowing that leadership falls under the category of soft skills. There are other competencies that respondents think that they are important to be acquired by project managers such as having confidence, motivating employees, encouraging innovation, and giving constructive feedback to improve the quality of the work. The most repeated answers on how these competencies can be obtained are:

- Through training programs
- Naturally born with it
- Through communication and dealing with people

90% of the respondents agreed on the necessity of the concept leadership in the era of the fourth industrial revolution, as it will be taking place in project management in a way where project managers must have leadership skills to influence and motivate their team members on using the new systems and technologies and by encouraging innovation and creativity to implement the 4^{th} industrial revolution requirements. According to the responses of the

survey questions, the most leadership skills that are impacted by the 4th industrial revolution are as the following order:

1- Creativity and innovation as there are a lot of new and advanced systems to facilitate project management processes from data sharing to reporting.
2- Communication will be easier through the cloud computing systems which enables the sharing and access to these files anytime and by all users who are working in this project.
3- Efficiency and effectiveness will increase as a result of the innovative systems and the ease of communication; knowing that delays will be decreasing.
4- Monitoring by project managers over the entire project and team members over their task progress will be done without the need to be present in the project site all the time.
5- Teamwork will be increasing as these systems will be creating a more connected environment.
6- Accountability will be almost shared since the project manager and the team members have access to the files to track the completion levels.

The concept "leadership" has proven the importance to shed light and have a great focus on the human side and the human factor of any organization in order to succeed in implementing the fourth industrial revolution (Oberer & Erkollar 2018). Knowing that people have the most control to best implement the requirements of industry 4.0, attain positive outcomes, and overcome the possible threats.

The conceptual framework discusses how the independent variables, dependent variables, and the moderator variables. The independent variables are the 4th industrial revolution innovations and developments such as cloud computing systems, governance technologies, internet of things, artificial intelligence, and virtual reality systems. However, these independent variables result in outcomes that are known as the dependent variables; in this case, there are positive dependent variables and negative dependent variables in the context or project management. The positive dependent variables are resulting from practicing leadership skills as it will encourage team members to be innovative and productive by using the systems that implement the 4th industrial revolution requirements, and this will maximize the benefits of implementing these new systems in the project management profession. Where on the other hand, the negative dependent variables are resulting from lack of leadership and negligence from project managers specifically as it will cause having project managers who are unable to balance between the use of these systems and the use of human

skills. This will lead to resistance to change, fewer job opportunities, and increased cyber threats.

The table below shows the main differences between practicing leadership in project management while implementing the 4th industrial revolution requirements, and the negligence in project management while implementing the 4th industrial revolution requirements:

Leadership	Negligence
High productivity	Low productivity
Innovation and creativity	Resistance to change
Low cyber threats	High cyber threats
Motivated employees	Demotivated employees
Instant correction actions	Delayed correction actions
Positive outcomes	Negative outcomes

CHAPTER SEVEN: CONCLUSION & RECOMMENDATIONS FOR FURTHER RESEARCH

7.1. Conclusion

The fourth industrial revolution is the era of today's world where it is beyond the use of advanced technology; it is about having systems that are interconnected and others that do complicated work without the intervention of humans. This era has its benefits on the economy, organizations, and individuals; as it will boost the nation's economy, increase organizations' productivity, and improve individuals' lives from the way they are being served to creating job opportunities. However, the 4th industrial revolution has its drawbacks as well when the reliance on systems and technologies becomes so heavy. These drawbacks can be eliminating job opportunities and higher cyber risks.

The fourth industrial revolution impacts many industries and departments such as healthcare, education, manufacturing, and project management; and this research paper is focusing on project management. Project management is highly influenced by this era as the processes are being improved and developed to meet the requirements of the 4th industrial revolution, making it easy for project managers to monitor and communicate through cloud computing systems and do much more. However, the results or outcomes that are coming from the 4th industrial revolution are caused by other factors and the way these systems are being utilized. The two main factors that are mentioned in this research paper are leadership and negligence. Leadership is a soft skill that project managers need to influence the employees' behavior positively, whereas negligence is when project managers don't show interest or care to employees or systems which will affect the organization negatively.

It is crucial to understand that if project managers were able to balance between the utilization of the 4th industrial revolution requirements and the leadership skills then they are making the maximum benefit of both worlds which will increase employees' productivity, improve effectiveness and efficiency, encourage innovation, stay updated, and facilitate project management processes; and all of this will allow the organizations who adopt this idea to be pioneers of the future. Not to mention that this idea is focusing on both the new systems as well as human skills because humans will remain the main changing point because they are the ones who are making these machines and systems and because humans have skills that cannot be acquired by machines such as leadership skills, ethics, and emotions.

This research paper has been able to achieve its aim which is to understand the role of leadership in the fourth industrial revolution in the context of the project management profession by providing an integrated framework that puts all these three elements together. Moreover, the paper achieved the objectives that have been identified in earlier which are:

1- Reviewing the current literature on project management and leadership, as both concepts have been thoroughly discussed and explained. This research has looked into traditional project management as well as hybrid project management. Whereas the general concept of leadership has been identified as well as the concept "leadership 4.0".
2- Identifying the different skills that are interrelated with project management leadership, which are the soft and hard skills that are required in project management.
3- Exploring the importance of the 4th industrial revolution in the context of project management, as this dissertation have showed the 4th industrial revolution in relation to Aldefer's ERG theory. Also, the importance of the 4th industrial revolution has been highlighted, with focus on project management before industry 4.0 and project management after industry 4.0.
4- Examining the opportunities and challenges of the 4th industrial revolution in the context of project management, and how are they impacting project managers and their workflow.
5- Proposing an integrated framework that best captures the leadership skills to allow project management professionals to cope with the requirements of the 4th industrial revolution, as this framework includes independent variables, dependent variables (positive dependent variables and negative dependent variables), and moderator variables (leadership and negligence).

Furthermore, the hypothesis that had been stated earlier which is "Achieving a balance between deploying leadership skills and implementing the 4th industrial revolution requirements will result in having a smooth workflow in project management processes that takes less time but achieves high productivity." is fully supported by the arguments of the literature review, the conceptual framework, and the findings of the surveys.

7.2. Recommendations for Further Research

The recommendations will be categorized into three main domains which are knowledge, technological, and management.

- In the **knowledge domain**, it is important to focus on building knowledge to develop project managers' and employees' soft and hard skills such as communication, teamwork,

technician skills, and other skills through training programs and workshops that are done monthly. This will result in productivity in accomplishing tasks, effectiveness and efficiency, lower employee turnover, and employee satisfaction. According to Jehanzeb (2013), development training will not only enhance work competencies but also work performance.

- In the **technological domain**, project managers must invest in implementing new technologies and systems in order to meet the requirements of today's industrial revolution. This will enable project managers and employees to utilize these systems in the best way possible to achieve quality and productivity, as well as enabling them to secure the systems to prevent any cyber threat that is widely spread. In this domain, it is crucial to limit the number of users and give a few ultimate authorities to prevent cyber threats. Also, it is suggested to have an innovation and creativity center in the organization to design a special system that would assist their project management process. For example, develop a virtual reality system to simulate a construction project to visualize the spacing and materials used.
- Lastly, in the **management** domain and specifically project management, it is essential to monitor work progress and ensure that the outcomes are serving the organization's aims and objectives. However, this should be done by using the new innovative systems that allow the facilitation of progress tracking and reporting, as well as using leadership skills to manage the team members and motivate them to work to their full potential.

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Appendices

1. What is your gender?

- Female
- Male

2. Soft skills are the traits (e.g. leadership & communication), and hard skills are the technical abilities (e.g. planning & quality management). Soft skills are more important than hard skills.

-Strongly agree -Agree -Neutral -Disagree -Strongly Disagree

3. Project management is a set of practices that includes initiating, planning, executing, monitoring and controlling, and closing of a project that has been done by the project manager and the project team in order to achieve specific goals and objectives. Rank the following skills of a project manager in order of importance – 1 being the most important and 5 being the least important.

- Communication
- Critical thinking
- Leadership
- Decision making
- Quality management

4. Leadership is the ability to lead and influence individuals, teams, or an organization. What other leadership competencies and skills that are important in project management?

---

5. How do you think these competencies can be acquired?

---

6. The fourth industrial revolution is the era of advanced technologies and disruptive developments in order to survive the modern society lifestyle (e.g. virtual reality,

artificial intelligence & robotics). How strong do you think fourth industrial revolution impacts project management?

- Huge impact (%100 - %80) - Big impact (%80 - %60) - Moderate impact (%60 - %40) - little impact (%40 - %20) - Hardly an impact (%20 - %0)

7. How strong do you think fourth industrial revolution impacts leadership?

- Huge impact (%100 - %80) - Big impact (%80 - %60) - Moderate impact (%60 - %40) - little impact (%40 - %20) - Hardly an impact (%20 - %0)

8. What is the best statement to describe the fourth industrial revolution?

- Facilitating the work processes by using advanced technologies
- Dependence on technologies more than humans
- Creating new markets and job opportunities

9. The fourth industrial revolution's opportunities are more than its challenges.

- True - False

10. In your opinion, what are the opportunities that come from the fourth industrial revolution?

_____

11. In your opinion, what are the challenges that come from the fourth industrial revolution?

_____

12. Leadership is needed in the era of the fourth industrial revolution.

- True - False

13. How do you think leadership will take place in the fourth industrial revolution in the context of project management?

_____

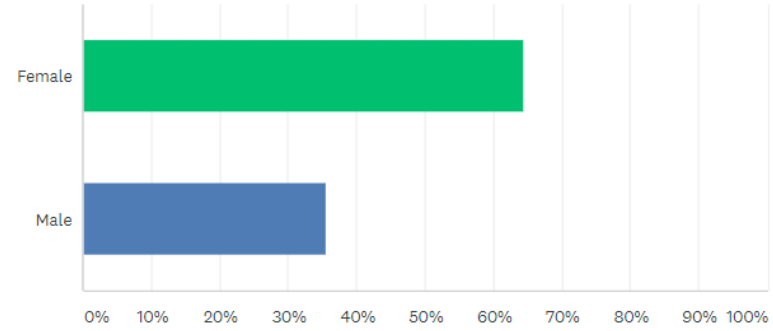
14. What leadership skills of a project manager that will be most impacted in the 4th industrial revolution era? (you can choose more than one)

- Communication

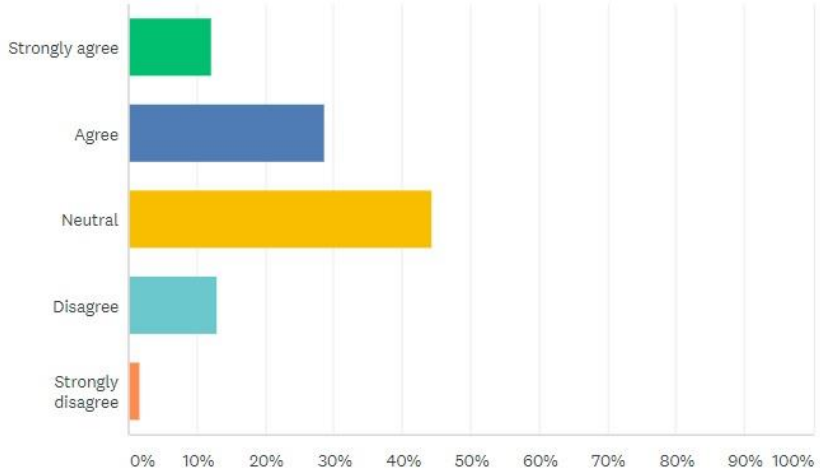
- Efficiency and effectiveness
- Teamwork
- Creativity and innovation
- Accountability
- Monitoring

15. Name any form of implementation in project management that adopts the requirements of the fourth industrial revolution.

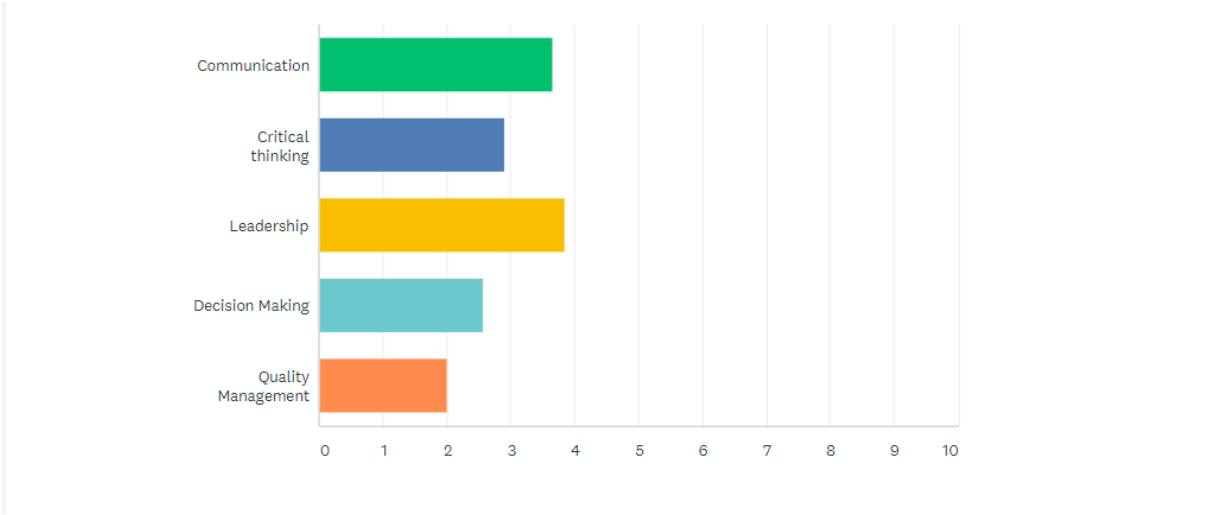
_____



ANSWER CHOICES	RESPONSES	
Female	64.35%	74
Male	35.65%	41
TOTAL		115



ANSWER CHOICES	RESPONSES	
Strongly agree	12.17%	14
Agree	28.70%	33
Neutral	44.35%	51
Disagree	13.04%	15
Strongly disagree	1.74%	2
TOTAL		115



Leadership is the ability to lead and influence individuals, teams, or an organization. What other leadership competencies and skills that are important in project management?

Answered: 114 Skipped: 1

RESPONSES (114) WORD CLOUD TAGS (0) Sentiments: OFF

Apply to selected Filter by tag Search responses

Showing **114** responses

Ability to take a decision making in the right path and communicate well with others
11/17/2019 4:17 PM View respondent's answers Add tags

open to other options, communicate with individuals and taking different opinions instead of sticking to their own
11/17/2019 4:02 PM View respondent's answers Add tags

Justice with members
11/17/2019 3:58 PM View respondent's answers Add tags

Important skills to be able to manage and do things as you're told to.
11/17/2019 3:52 PM View respondent's answers Add tags

The ability to handle any problems quickly and make quick decisions

How do you think these competencies can be acquired?

Answered: 114 Skipped: 1

RESPONSES (114) WORD CLOUD TAGS (0) Sentiments: OFF

Apply to selected Filter by tag Search responses

Showing **114** responses

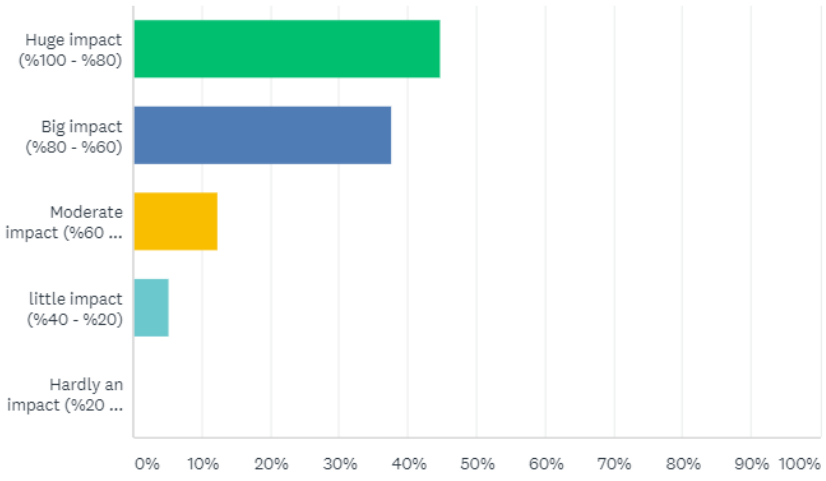
By giving the team members the ability to do several things with a good amount of responsibility
11/17/2019 3:06 PM View respondent's answers Add tags

Helping each other and supporting
11/17/2019 3:03 PM View respondent's answers Add tags

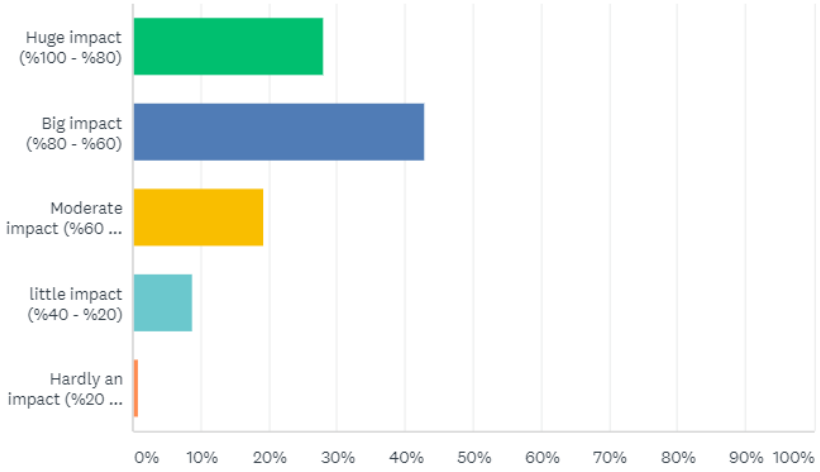
To have successful project with your team
11/17/2019 3:03 PM View respondent's answers Add tags

By hard work
11/17/2019 3:00 PM View respondent's answers Add tags

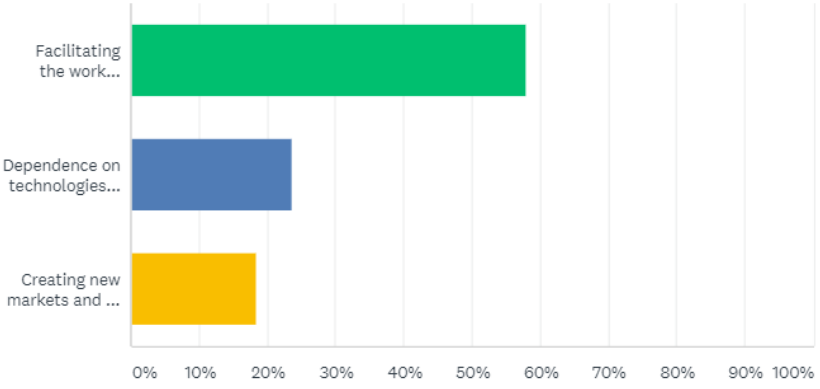
Confidence



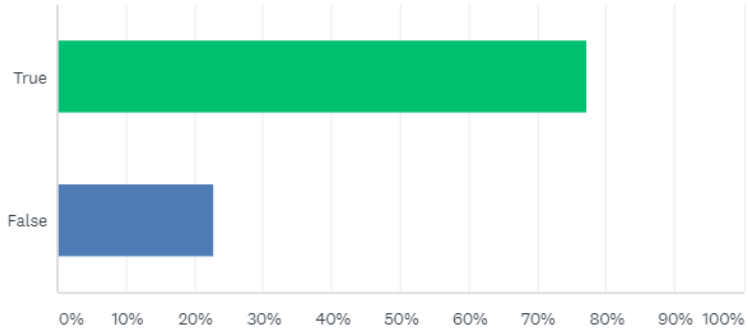
ANSWER CHOICES	RESPONSES	
Huge impact (%100 - %80)	44.74%	51
Big impact (%80 - %60)	37.72%	43
Moderate impact (%60 - %40)	12.28%	14
little impact (%40 - %20)	5.26%	6
Hardly an impact (%20 - %0)	0.00%	0
TOTAL		114



ANSWER CHOICES	RESPONSES	
Huge impact (%100 - %80)	28.07%	32
Big impact (%80 - %60)	42.98%	49
Moderate impact (%60 - %40)	19.30%	22
little impact (%40 - %20)	8.77%	10
Hardly an impact (%20 - %0)	0.88%	1
TOTAL		114



ANSWER CHOICES	RESPONSES	
Facilitating the work processes by using advanced technologies	57.89%	66
Dependence on technologies more than humans	23.68%	27
Creating new markets and job opportunities	18.42%	21
TOTAL		114



ANSWER CHOICES	RESPONSES	
True	77.19%	88
False	22.81%	26
TOTAL		114

Q10

Save as

In your opinion, what are the opportunities that come from the fourth industrial revolution?

Answered: 114 Skipped: 1

RESPONSES (114) WORD CLOUD TAGS (0)

Sentiments: OFF

Apply to selected Filter by tag

Search responses

Showing **114** responses

Develop in everything and being opened to all people around the world
11/18/2019 12:17 PM View respondent's answers Add tags

I have no idea
11/18/2019 8:16 AM View respondent's answers Add tags

i cannot answer
11/17/2019 7:29 PM View respondent's answers Add tags

It will ease the communication and adjust quickly to changes to new information especially in manufacturing industry.
11/17/2019 7:10 PM View respondent's answers Add tags

In your opinion, what are the challenges that come from the fourth industrial revolution?

Answered: 114 Skipped: 1

RESPONSES (114) WORD CLOUD TAGS (0) Sentiments: OFF

Apply to selected Filter by tag Search responses

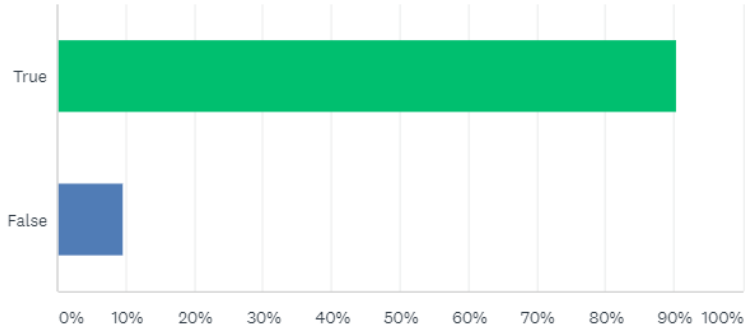
Showing **114** responses

Lack of jobs
11/17/2019 3:12 PM View respondent's answers Add tags

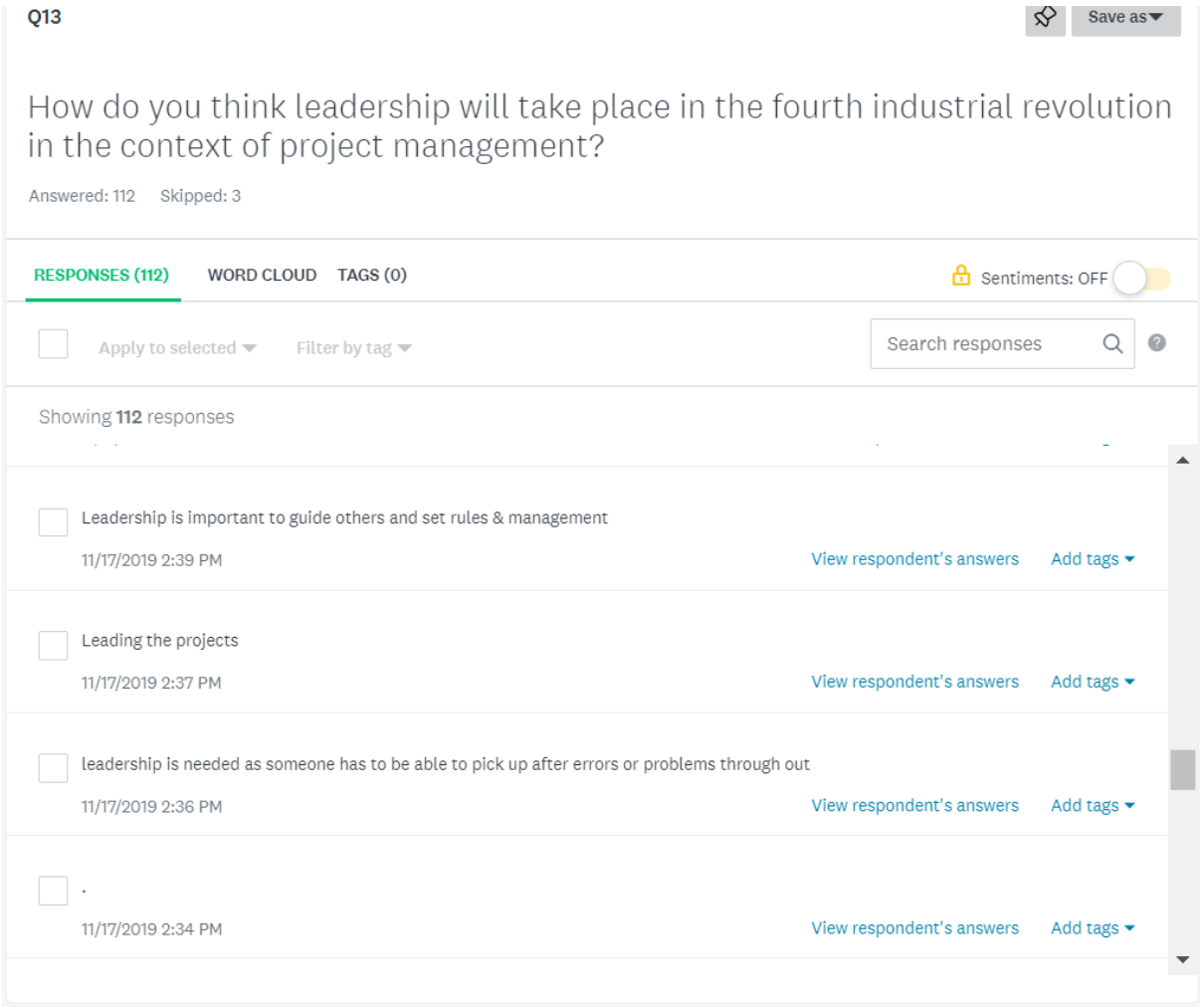
Decreasing job opportunities
11/17/2019 3:08 PM View respondent's answers Add tags

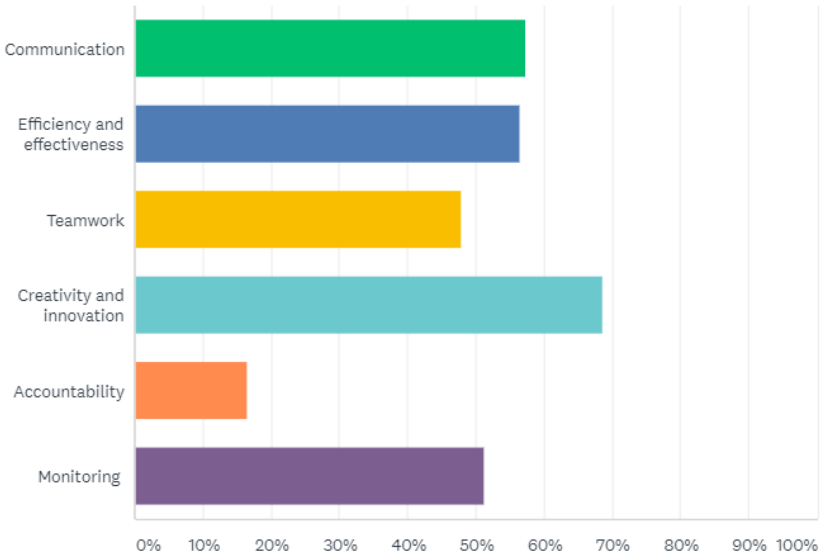
Mechanic damage
11/17/2019 3:06 PM View respondent's answers Add tags

Losing your job
11/17/2019 3:03 PM View respondent's answers Add tags

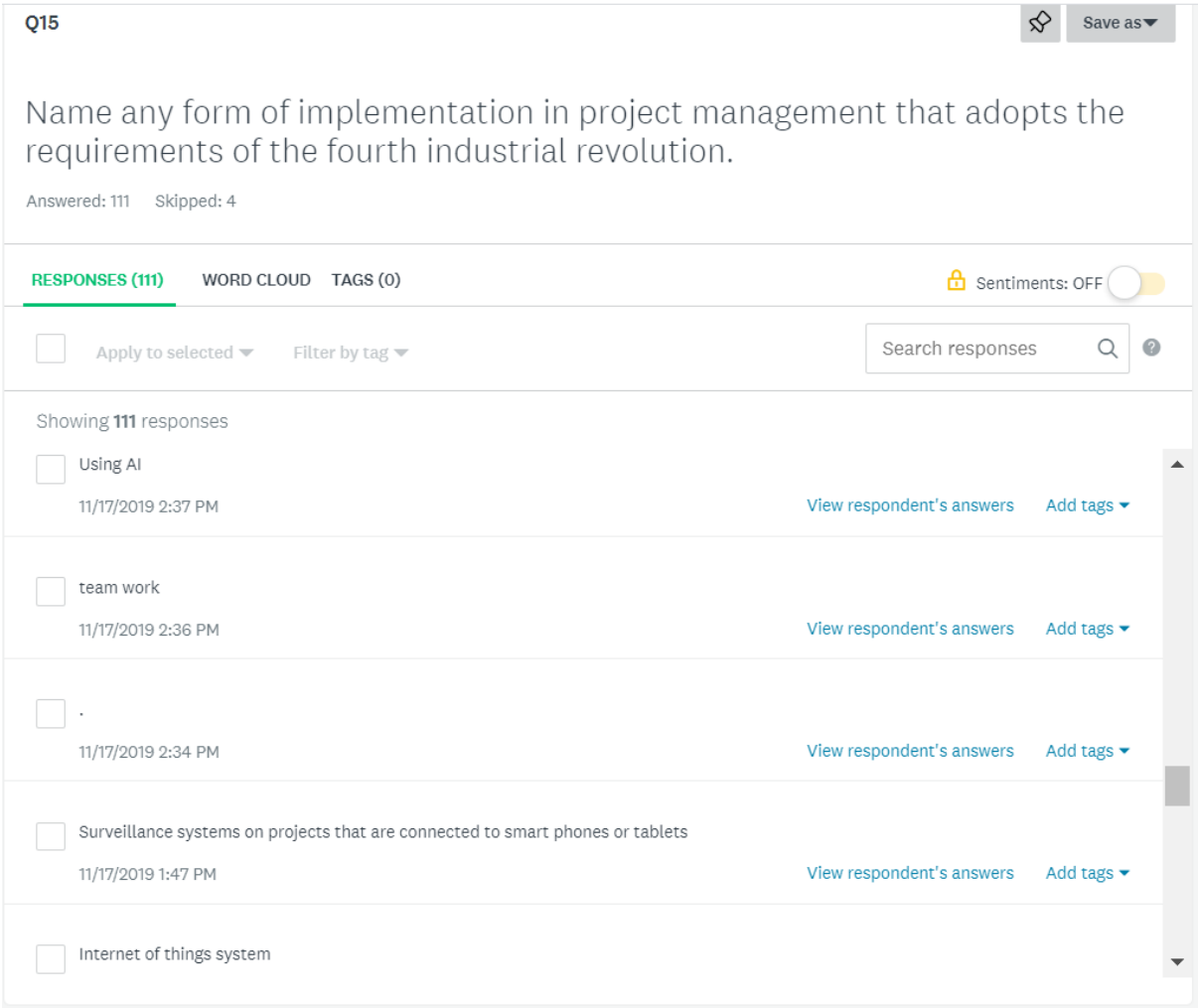


ANSWER CHOICES	RESPONSES	
True	90.35%	103
False	9.65%	11
TOTAL		114


Q13
Save as
How do you think leadership will take place in the fourth industrial revolution in the context of project management?
Answered: 112 Skipped: 3
RESPONSES (112)
WORD CLOUD
TAGS (0)
Sentiments: OFF
Apply to selected
Filter by tag
Search responses
Showing 112 responses
Leadership is important to guide others and set rules & management
11/17/2019 2:39 PM
View respondent's answers
Add tags
Leading the projects
11/17/2019 2:37 PM
View respondent's answers
Add tags
leadership is needed as someone has to be able to pick up after errors or problems through out
11/17/2019 2:36 PM
View respondent's answers
Add tags
.
11/17/2019 2:34 PM
View respondent's answers
Add tags



ANSWER CHOICES	RESPONSES	
Communication	57.39%	66
Efficiency and effectiveness	56.52%	65
Teamwork	47.83%	55
Creativity and innovation	68.70%	79
Accountability	16.52%	19
Monitoring	51.30%	59
Total Respondents: 115		


Q15
Save as
Name any form of implementation in project management that adopts the requirements of the fourth industrial revolution.
Answered: 111 Skipped: 4
RESPONSES (111)
WORD CLOUD
TAGS (0)
Sentiments: OFF
Apply to selected
Filter by tag
Search responses
Showing 111 responses
Using AI
11/17/2019 2:37 PM
View respondent's answers
Add tags
team work
11/17/2019 2:36 PM
View respondent's answers
Add tags
.
11/17/2019 2:34 PM
View respondent's answers
Add tags
Surveillance systems on projects that are connected to smart phones or tablets
11/17/2019 1:47 PM
View respondent's answers
Add tags
Internet of things system